# SPONGES

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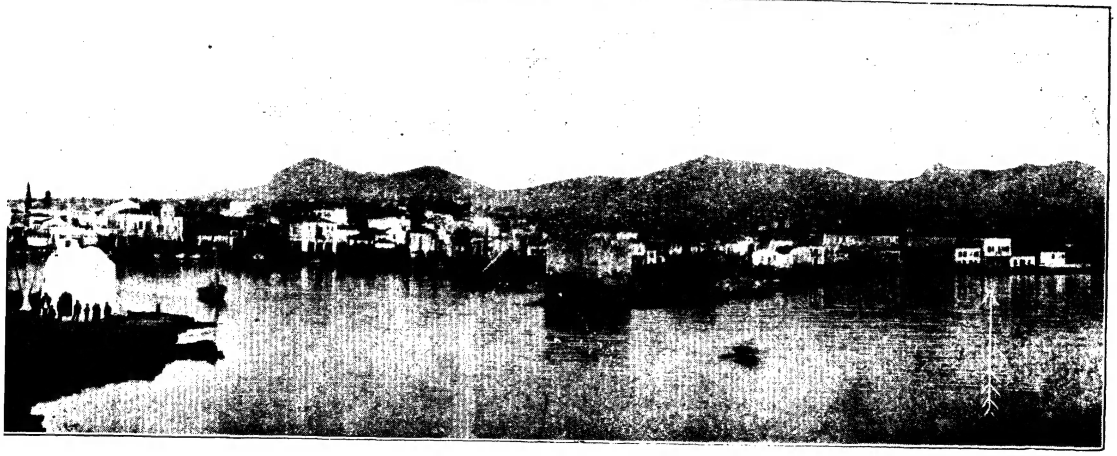

ENTRANCE TO PORT OF AEGINA (GREECE)

Showing old Turkish Fort in centre, Greek Chapel on extreme left, and on extreme right the warehouses of International Sponge Importers, Limited

(1463M)

*Frontispiece*

PITMAN'S COMMON COMMODITIES
AND INDUSTRIES SERIES

# SPONGES

THEIR NATURE, HISTORY,
MODES OF FISHING, VARIETIES,
CULTIVATION, ETC.

BY

ERNEST J. J. CRESSWELL

*SECOND EDITION*

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# SPONGES

## CHAPTER I

### SPONGES

Nature of sponges—Imitations composed of rubber, soft leather, etc.—Sponges in ancient Greek literature—Celebrated divers of olden times—Titles of ancient books and poems with reference to sponges—Full description of celebrated divers in Greek history.

THE sponges which form the subject of this work are those amongst a numerous species, which are of use to man in an infinite variety of ways. They are of the soft, absorbent and compressible texture which Nature provides and, in a defiant mood, challenges man to successfully imitate or equal. She surrounds their growth and propagation with difficulties which compel man, when he wants to fish them, to use all his ingenuity to overcome. The manner in which he has conquered these difficulties will be described in some of the following pages.

There are many other kinds of sponges to be found in all parts of the world which are of no use to man. Some of them, such as the "Venus's flower-basket," are of great beauty. None are fished, however, except the commercial sponges, which thrive to perfection in the tideless waters of the Mediterranean, and the West Indian, Cuban and Florida sponges which are found in the warm waters of the Carribean Sea and the Gulf of Florida.

The imitations of sponges, made by man, include the product of finely divided soft leather held together

by a flexible adhesive, and the variously compounded india-rubber sponges. Some of the latter, although a long way from the type their makers set out to imitate, are the nearest approach to the original and unmatchable sponges of Nature. Rubber sponges have not the quality of "sponginess." They are devoid of capillary attraction and so cannot absorb water in the way the natural sponge does. In its application to the skin it fails altogether in the wonderful cleansing property of Nature's product, for it skids over the surface of the skin and consequently fails entirely to remove any undesirable matter that the pores throw off, or any dirt that may soil it. With the addition of soap, the rubber sponges become effective as a remover of "matter in the wrong place," as the first Sir Robert Peel called dirt, but when the soap has been removed, it is ineffectual by reason of the skidding effect. The theory that sponges are immigrants to the Mediterranean, where, after a great number of centuries, they so improved upon their type that they have become the best of their kind, is not only probable but is the only one that explains that superiority.

The necessity of keeping the human skin in constant activity is not sufficiently recognized. It is a medical fact that every human being of average weight and height gives out through the skin a pint of water in every twenty-four hours. This carries with it effete matter from the blood-stream, and greatly assists in keeping the body in good health.

The pores of the skin must, therefore, be kept open and freed from the salts of perspiration. The sponge is Nature's gift to man, enabling him to effect that purpose easily. A hot bath prepares the skin to be cleansed and the sponge completes the process.

If a sponge is held up horizontally close to the eyes, it

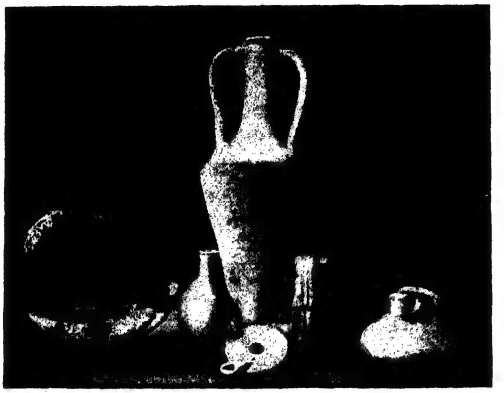
will be seen to be covered with small eye-lash-like filaments called cilia, from cilium, the Latin for eye-lash. These penetrate the pores of the skin, and free them from any deposits that remain in them. The daily bath may not be necessary when the sponging of the body can do all that is required, quickly and without waste of water.

## A Survey of the Works of Ancient Greek Poets and Prose Writers, containing many Allusions to Sponges and Sponge Fishing

**Sponges in Ancient Greek Literature.** The sponge, which thrives amongst marine grass or on flat bottoms of the sea, is frequently uplifted by currents and thrown by the waves on to the shore. Here, owing to the action of the waves, it is rolled in the sand, thereby losing its outer skin and sarcode and becoming fit for use, although harder than sponges brought up living from the sea bottom.

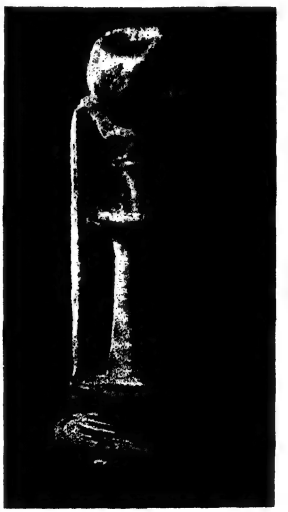
It was owing to this natural throwing-up and cleansing process that the sponge was supposed to have been discovered by the Phoenicians and Egyptians. In the Old Testament mention is made of the sponge, and it is either the Phoenicians or the Egyptians who, on arrival in Greece, not only taught the religion of their gods, the way to write, and the mode of their own civilization, but also demonstrated the practical use of the sponge. Since this epoch the sponge has been in common use in Greece, consequently developing into a large industry employing thousands of people and entire towns.

A great number of Greeks are brought up from infancy in this industry. They learn to swim and dive, making a practice of remaining for a comparatively long time under water. This particular feature was introduced into the Olympic Games and had its champions.



GROUP OF WATER VESSELS

One with sponge adhering to it, recovered by divers from a submerged island in the Greek Archipelago



ANCIENT GREEK LAMP

With sponge grown to the oil reservoir, found by a Greek sponge diver in 140 ft. of water off Syria. The lamp is of bronze, and dates 300 years B.C.

Many books and poems have been written on sponge fishers, but unfortunately the majority of these writings were destroyed by invaders who burnt the Alexandrian Libraries, the first by Caesar and the second by Caliph Omar in 640.

The following titles alone remain—

| | | |
|---|---|---|
| *Diver* . . . . . | by | Kroton |
| *Glafkos the Sailor* . . | ,, | Aeschylus (Tragedy) |
| *The Fishermen and the Heliotes* | ,, | Menander (Comedy) |
| *Hymn to Glafkos* . . . | ,, | Evanthos |
| *Work of the Sea* . . . | ,, | Pangratur the Arcadian |
| *Land and Sea* . . . | ,, | Epicharmus |

The following, with many others, have also written about sponges—

| | | | |
|---|---|---|---|
| Agathocles of | Atraco | Kekilias | of Argos |
| Pangratios ,, | Arcadia | Possidonios | ,, Corinth |
| Selefkios ,, | Tarsos | Leonidas | ,, Byzantium |

Happily a poem entitled "Sponge Fishers," by Oppianos, the Cilician, compensates us somewhat for the losses of other works.

From a scientific and commercial point of view, the great Aristotle is the author who has given us the most valuable information on fishermen and sponges.

**Celebrated Divers and Swimmers in Ancient Times.** Swimming and the art of diving were already known in the days of Homer, and during historical times these accomplishments developed into a trade. Plato mentions amongst sundry callings that of the diver, and at Ermioni, a town of the Argolide, diving sports were held, as well as in other places. All swimmers were divers, and nearly every diver a sponge fisherman.

Entire towns were devoted to the occupation formed by the fishing industry. A certain town known now as "Cheli" was formerly known by a name, the translation of which meant "Fishermen." The inhabitants

of this town previously lived at Tiriginthe, but owing to a revolution were obliged to emigrate. Before proceeding elsewhere, they sought advice from the " Oracle of Delphi " who advised them to seek an abode on the coast of the Ermioni, call their town " Fishermen," and continue their trade there.

Many sponge fishers dwelt at Anthidoni in Boeotia, opposite the Island of Euboea, and also on the Island of Delos. The Greeks of Scione in Thrace were renowned for their swimming and diving exploits.

Amongst the best-known divers was " Glafkos " of Anthidoni, upon whom the titles of " Glafkos Anthidonian "—" Ocean Sailor " and " God of Fishermen," —were bestowed. Glafkos was the son of Anthedouer and Alkou. He was known to be a fisherman, a good boat builder, a good sailor, and a good warrior. It was he who constructed the *Argo* of the Argonauts, which carried Jason in search of the Golden Fleece, and, when Jason fought the Tyrians, Glafkos was the only one who escaped wounds during the naval battle. He predicted a great future for navigators.

He married Symi, the daughter of Iklemon and Loti, and after emigrating with other fishermen, came to live on a desert island off the coast of Karie, to which he gave his wife's name It is called Symi to this day.

His next marriage was with Ydna, the daughter of Skyllos the famous diver. The poetess Edyli relates in a certain poem how Glafkos fell in love with Scylla, with whom he entered into her grotto. Kirke, jealous of Scylla, transformed her into a monster. Glafkos was also known to have gone as far as Sicily to fish for sponges.

Despite the numerous trades and accomplishments of Glafkos, the one he excelled in was diving, and it is said of him—

" Amongst fishers he was the best, being famous for

diving and remaining a long time at the bottom, being as much at home there as on land."

It is thought that Glafkos could remain for days under the sea, and he is depicted in legends as being received by Ocean and Thetis. On account of this, he was classed amongst the gods of the sea. The following is related of him by Palaofatos—

" Glafkos was the best diver in his town of Anthinous, and once he threw himself into the sea before the multitude. Diving down, he hid himself behind a rock and eventually disappeared far from the view of the watching crowd. He returned several days later with many fish, caught during a tempest when other fishermen were unable to catch any. On being questioned, he stated that he had spent the days at the bottom of the sea with Ocean. One day he dived never to return, and the people, thinking he had no further desire to return to land, named him a god. The rock from which he used to dive is still to be seen, and is called ' The Leap of Glafkos.' "

Another famous diver was Scyllias, originally from Scioni in Thrace. He had a daughter named Kyani, who, having learnt her father's trade, helped him in his work. Herodotus said that Scyllias and his daughter were engaged by the Persian fleet to salve the treasures from their enemy's boats which sank from time to time. By thus doing they realized big profits. Nevertheless, Scyllias was a Greek and a good patriot, and when a considerable number of the Persian fleet sank near Pylion he swam from Afeton to Artemision to inform the Greeks of this happening. He also informed the Greeks that the remainder of the Persian fleet had sailed towards the Ebee. The Grecian fleet profited by this information and routed the enemy at Artemision, gaining a complete victory.

**A Curious Custom.** A curious custom prevailed in Himia, one of the little islands of the Greek Archipelago. The girls of this tiny island exercised the right to propose to the men! The inhabitants of Himia are engaged mostly in sponge fishing. When a girl desired to marry, she waited until she had obtained the number of sponges from the sea that corresponded with the number of years she had lived. These she placed in a silk net, which she presented to the man of her choice. Should he refuse, his chances of obtaining another bride were remote, as usually the Himian maidens shunned him as a punishment.

## CHAPTER II

### THE SPONGE TRADE AND HOW IT WAS CARRIED ON IN ANCIENT TIMES

Classification and origin of sponges from Greek literature—Ancient commerce in sponges and their uses—Sponge fishing as it existed down to middle of last century.

It is somewhat difficult to state how sponge fishing was carried out in ancient times, because, as we have already stated, the precious libraries, wherein most of the writings dealing with the subject were kept, were burnt by ignorant enemies. However, the information which is in our hands clearly shows that the sponge trade of ancient times did not have the same advantages that it has to-day.

It is known that sponge fishing was the occupation of men who made a specialty of this kind of fishing. From the days of their infancy they practised this trade. The fishermen became associates and worked for their own mutual profit.

The poet Oppianos gives his description of the sponge trade as follows—

" I say there is no harder nor sterner work than that of the sponge fisher. It is a struggle for which they must need be armed. They neither eat nor drink as other fishermen. From their infancy they exercise themselves in retaining their breath to a high degree, and pray unto the gods in order that a shark may not cross their path.

" When the fisherman meets with a porpoise, the presence of which denotes that there are no sharks in the immediate vicinity, his courage is fortified, and he

dives into the sea feeling reassured. That is why it is called a 'sacred fish.' Before the diver prepares to dive a rope is tied round his waist. In one hand he holds a heavy weight of lead and in the other he carries a knife. He then stands on the prow of the boat and, after encouragement from his companions, dives head first into the sea, dragged down by the weight of lead. On sighting sponges, he immediately detaches them with his knife. In a few moments he pulls on the rope, which action informs the people on the boat that it is high time he was pulled to the surface again."

Aristotle also mentions the diver plunging with reassurance after sighting a porpoise, as where this fish is to be found there is no danger of sharks.

For obtaining oysters and sponges, divers used an instrument called a "ganganon," or what is termed to-day a "cancava." This instrument is composed of one round iron bar to which is attached a strong net. By dragging this along the sea-bottom the bar uproots all things that grow thereon, these falling into the net.

The ancients also used what is known to-day as a "Kamaki" or Kamax. It is not known whether with this instrument they could attain as great depths as are reached to-day.

Aristotle mentions an instrument which was in use at that time, by means of which fishermen could remain some considerable time under water. This instrument, he says, was a means by which air from the surface could be conveyed to the man on the sea-bottom, in a similar way to the manner in which an elephant makes use of his trunk. In other words, a tube arrangement for pumping down air. Therefore, by what Aristotle tells us, the ancients had already instituted a sort of diving outfit. It is very regrettable that he gives no further details, as it is probable that this ancient system

was less dangerous than the one of to-day, which is the cause of many accidents and fatalities amongst divers; although, of course, the present diving apparatus enables the diver to descend to much greater depths.

**Classification and Origin of Sponges.** Aristotle mentions the sponge as a "zoophyte," whereas to-day it is recognized as an animal of simple organism. The kinds of sponges known then were classed as follows: Venise or Honeycomb, Zimoccha, Fine Turkey. Hard sponges were of no value to the trade, and were called "wild" or "mud." Sponges thrown up by the sea were called sea-rags. Aristotle also informs us precisely where the best sponges were to be found. On the eastern side of Cape Matapan there are beautiful sponges, but beyond that region they are of lower grade.

ANCIENT DIVER

Sponges were named according to their origin, viz.: Bougasi, Ionian Island, Caramania, etc., where he said the finest weed sponges were to be found. We also see that in those times the Greeks considered the best sponges to be those we also consider the best in England to-day—sponges elastic and not hard.

**Ancient Commerce in Sponges—Their Uses.** We can give no real estimate as to the fishing commerce in ancient times, but we have sufficient proof to enable us to say that sponges in those days were much more in common use than they are to-day.

ANCIENT SYSTEM

Diver with rope round his waist, leaden weight uplifted, knife in left hand, and net to receive his catch, ready to plunge into the sea

At this period the Grecian people were the chief consumers of sponges, the Greeks being the only civilized people. Let us mention in historical order the nations which later on made use of sponges: Phoenicians, Egyptians, Greeks, Romans, Byzantines and Venetians. All these peoples during the height of their civilization used large numbers of sponges. After their downfall the use of sponges died out, comparatively speaking. It would, therefore, be safe to assume that the most civilized nation is the one which uses the most sponges.

Homer mentions in the *Iliad*: "He washed his face, his two hands, his body and his heaving chest." (Chapman's translation of this passage is: "Then with a sponge he drest his face all over."—*Iliad*, xviii.)

Homer and also other writers tell us that the sponge was the *sine quâ non* of a kitchen. Homer mentions in the *Odyssey* that the table was washed with a sponge.

A sponge in ancient times was an article necessary to every man of education, in order to clean his pens and to wipe out blots and mistakes on parchment or membrane. It is said that the Roman Martial sent his poems to Augustus with a sponge so that Augustus might obliterate what did not suit him. Augustus wiped out half of one of his tragedies through allowing the sponge to fall upon it.

Sponges were indispensable to painters in order to clean their pictures whenever necessary. One painter, it is said, was busily engaged in painting a horse. He was successful in every way, but unfortunately failed to depict satisfactorily the foam coming from the horse's mouth. Irritated by this, and out of patience, the painter threw the sponge at the picture and, as luck would have it, it fell right on the very spot where the painter had left off and made a blot resembling exactly the foam and also the desired effect which he

himself had in vain striven to obtain. Sponges were very necessary to the doctors and chemists of those days. The eyes were washed with sponges, and sponges, full of cold water were placed on the heads of those who had sunstroke, etc.

In the army the best sponges were used for placing inside the soldiers' knee-shields to prevent the knees from becoming cut. Every soldier had a sponge which he used in lieu of a cup for drinking purposes on long marches. This fact explains why the Roman soldier gave a sponge soaked in vinegar to Christ during the Crucifixion.

Sponges were used in religious ceremonies also. In ancient Greece there was a sacred mineral source named " Stygos." The water from this source fell from a distance drop by drop, and was accumulated by allowing it to drip on to a sponge placed below.

Sponges were then in abundance and very cheap. It is said that Thales, the wise man, ordered that all the empty amphorae which his mule carried should be filled with wool and sponges.

All cleaning work was done with the aid of sponges, and the phrase " a rag cannot replace a sponge " was used by the people of those days.

**Sponge Fishing as it Existed down to the Middle of the Last Century.** The sponge fisher of to-day still continues his work in the same districts as those mentioned in ancient history. Since Glafkos and his companions went to live on the isle of Symi their descendants learnt no other trade but his. That is to say, fishing, sponge fishing and the construction of fast sailing boats.

Symi, the principal market of to-day, exists as it did in the days of the celebrated Glafkos. The fishing fleet of this island, since the days of Glafkos, has been greatly augmented. Accompanied by the King, the great Nireus, it was seen at Troy. Kointos, the

Smyrnian, in the fifth century, speaks of the Symiotes as being the best sponge fishers.

Other markets include Aegina, Alicis, Anthidoni,

ANCIENT AMPHORA FOUND ON THE COAST OF SYMI WITH SPONGE GROWING ON THE MOUTH

Hellesponte, Casteloriso, Hydra, Calymnos and Halki, etc. But, up to the middle of the last century, the world's monopoly for sponges belonged to Symi and Calymnos.

## CHAPTER III

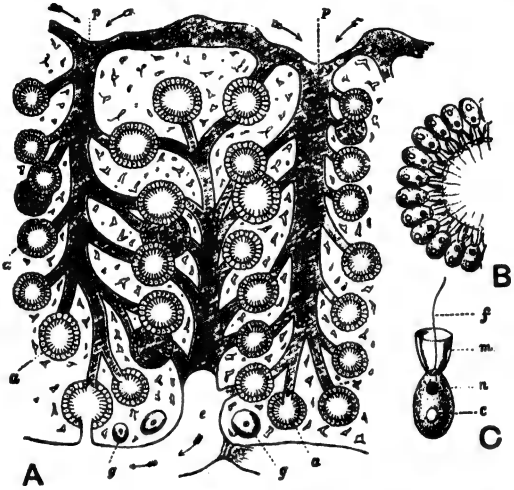
### THE NATURE AND GROWTH OF SPONGES

Ideal environment—Waters from which largest quantities are obtained—Structure—Reproduction—What kingdom, animal or vegetable ?—The three important species.

THE tideless waters of the Mediterranean, the average temperature of the water, and its freedom from currents, are all elements that make for the ideal environment for the growth of sponges. If proof were wanted that this is a correct surmise there is the fact that the waters of the Atlantic, which enter the Mediterranean at about a speed of 6 knots per hour, are not productive, and sponges are not found in any quantities until the Balearic Islands are passed. Then, from an imaginary line drawn from about Tunis to Italy, sponges become very prolific, and as the eastern part of the Mediterranean is reached, both in the north and south, sponges become more abundant and better in quality. From these waters by far the largest quantity of useful sponges are obtained, and no other waters produce anything like such valuable supplies of equal or perhaps greater bulk. Those of less value are obtained from the Bahama Islands, the Gulf of Florida, North Coast of Cuba, and in much smaller quantities from British Honduras and adjacent waters.

Sponges were regarded formerly as colonies of amoebae and classed among the Protozoa, but greater knowledge of their structure as many-celled organisms has caused them to be called Porifera (Latin *porus*—a pore, and *fero*—to bear). Traces of nerves and sensitory organs are found to exist in some of the higher developed sponges, as they appear to shrink when touched.

These beautiful and useful objects are woven of a material that is chemically allied to that spun by silk worms. The cells on the outside of the skeleton (which




SECTION OF A SPONGE WITH DESCRIPTION OF ITS STRUCTURE

EXPLANATION

A. Vertical section of outer layer, magnified 75 times; *p*. pores or openings of canals for conducting water which flows to *a*, sacs; *e*. canal for expulsion of water; *g*. early stages of spores.

B. Sac, transversely divided, 800 diameters, showing Sponge particles with cilia.

C. Sponge particle, highly magnified; *f*. cilium; *m*. collar; *n*. nucleus; *c*. contractile vesicle.

is the sponge of commerce) can procure food and oxygen easily. The cells inside effect this by means of cilia, whose duty it is to whip the water charged with food and oxygen through innumerable canals, when having served its purpose it is driven out through other canals.

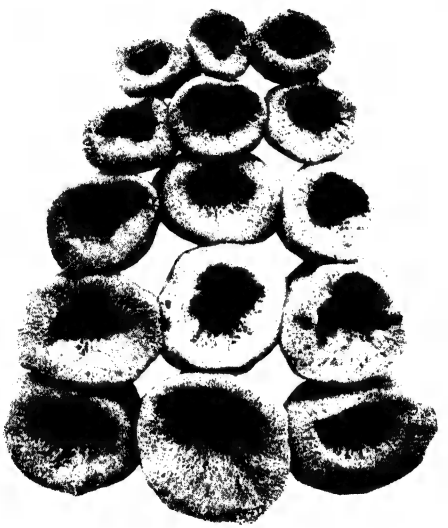
It has been aptly said by Huxley that the whole sponge resembles a kind of submarine Venice, " where the people are ranged about the streets and roads in such a manner that each can easily appropriate its food from the water as it passes along." When found at the bottom of the sea the sponge is covered inside and out by a gelatinous substance which absorbs particles of floating matter from the currents of water, and those particles that the sponge finds suitable for its nourishment are absorbed by the inner coating and digested. Those particles which are not nutritive are immediately rejected.

Reproduction of the species is effected particularly by gemmation. The little gemmule is carried out by the exuding water, and fastens itself to a piece of rock or weed, and the life of the sponge begins over again. The gelatinous matter is distributed in a fibrous network in a definite pattern in each species.

An examination of the living sponge shows it to be covered by a well-defined skin in which are found blunt little spicules at more or less regular intervals over the ends of the principal channels of the sponge which supports them. Distributed over the surface are sieve-like membranes which lead into the interior of the sponge by numerous minute pores into many small pear-shaped chambers. These greatly increase in diameter until they open upon the surface of the sponge in one of the much conspicuous pores known as " Osculae " or, as the fishermen call them, " eyes."

Before giving a further description of the place given by marine scientists to the sponge in the scale of Nature, it might be well to record the fact that considerable doubt existed amongst scientists for a long period as to whether the sponge belonged to the animal or the vegetable kingdom. In the *Universal Magazine* for

September, 1766, there is a contribution from John Ellis, of Grays Inn, who says: "Among those animals commonly called 'Zoophytes' you may discover an evident approximation from the rudest irregularly formed sponge (which is the lowest being which I have

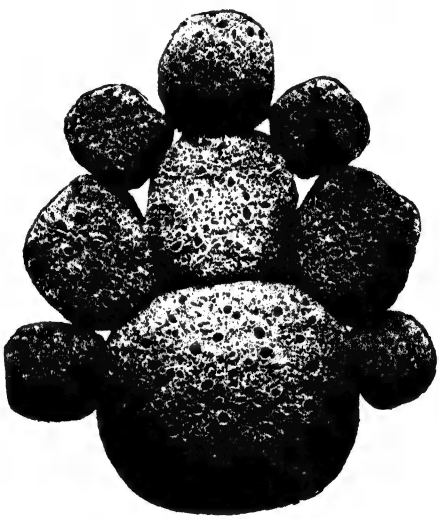


GROUP OF MANDROUKA FINE TURKEY CUP SPONGES
The finest of Turkey sponges

yet observed to have the appearance of animal life) to the most beautiful and elegant red coral.

"The nature and formation of sponges having never yet been thoroughly investigated, every attempt to explain this dark part of Nature must give satisfaction to the curious. If we consult the ancients we shall find that in the days of Aristotle the persons who made

it their business to collect these sponges perceived a particular sensation like shrinking when they tore them off the rocks, and in the time of Pliny the same thing continued, their having a kind of animal life in them." After this time no attention was paid to this kind of



GROUP OF MANDROUKA HONEYCOMB SPONGES, THE BEST OF ALL HONEY COMBS

knowledge, and there still remained the doubt until the illustrious Count Marsigli pronounced them " vegetable," as he did all the corals " Alcyoniums." It further goes on to state that : " Donati very judiciously says that the invaders of sponges such as small shells, stones, and a variety of different worms which perhaps live on the gelatinous part of the sponge, are not the fabricators

but the inhabitants therein, and states 'Alcyoniums' to be of animal origin, in which he has discovered evident marks of sensation."

It is a long step from such opinions as these to those held by scientists at the present time. When the sarcode is removed from the sponge the skeleton of the animal remains behind, and it is this skeleton which is the sponge of commerce, and is probably by far the most useful thing obtained from the bottom of the sea.

The finest in texture, the softest and most valued, because of its lasting properties, is the FINE TURKEY or LEVANT sponge (*Euspongia officinalis*). The other two principal varieties are the *Hippospongia* HONEYCOMB (Eng.), *Venise* (Fr.), *Pferderschwamm* (Ger.), and the "ZIMOCCA," *Euspongia zimocca*, *Fine dure* (Fr.), which is not so soft as the others.

These three species are found at depths varying from about three fathoms to one hundred fathoms, along the whole of the Mediterranean coast, including its various indentations and islands, except the western half. There are also large sponges which grow to a considerable size of a very fine texture, which from the fact of their growing in thin large flapping pieces are called "ELEPHANT EAR" sponges, *Lagofitas* (Gr.), and also sponges which the fishermen call "WILD" sponges, which are not flexible or absorbent, and are therefore thrown back into the water as useless.

## CHAPTER IV

### SPECIES OF SPONGES AS KNOWN IN THE WORLD OF COMMERCE TO-DAY

Five varieties named—Details given of regions from which different qualities are obtained—Islands mentioned from which sponges are obtained—Estimate of sponges taken by Greeks—Fishery season—Licences paid and taxes imposed—Different methods mentioned by various nationalities.

(1) The Fine Turkey Cup.
(2) The Fine Turkey Solid.
(3) Zimocca or Brown Turkey.
(4) Elephant Ears.
(5) Honeycomb.

THE above-named five kinds are again subdivided by sponge merchants into numerous sorts, generally known by the locality from which they come, and the mode of fishing by which they are obtained. These are still further distinguished by grades of quality, and even by the nationality of the fishermen who take them.

West of the imaginary line from Tunis to Sicily the fishery is unimportant, and the finer varieties, the toilet and cup sponges, are never found. To the east of this line the fishery becomes more and more important, the supply from the Adriatic, Aegean Sea and the Levant is smaller than formerly, owing to the long continued over-fishing to meet the ever-increasing demand for these and similar qualities. The most important developments of the fisheries on the African coast from Alexandria to the Western Frontier of Tunis have taken place during the last half-century.

The very finest grades come from the south-eastern

part of the Mediterranean, and the quality deteriorates as one goes westward along both the north and south shores. There are also sponges of considerable value in adjacent waters of the Mediterranean Sea, such as the Dardanelles, Sea of Marmora, the Bosphorus,

FINE SPECIMEN OF ELEPHANT-EAR TURKEY CUP
Circumference 3 ft. 3 ins.
Height 10 ins.

and parts of the Black Sea, but the quality appears to be inferior and the quantities are less in the order named.

In the Red Sea there are many sponges, but their quality is so inferior as to make them even not worth the freight that has to be paid for their transference to England.

The Greeks, both all over the Mediterranean and those coming from the Islands which formerly belonged

to Turkey, are the chief fishermen, dealers and merchants in sponges. The Italians inhabiting old Greek Colonies, like Trapani and Torre del Greco, to a much smaller extent practise the craft of fishing, but their produce is more generally purchased by merchants of other nationalities.

Some beds of sponges have been discovered in the Balearic Islands, and a few on the coast of Spain itself, but the results of the fishing of these sponges have not been encouraging. The sponge beds about the Greek and Turkish islands and the Archipelago, as will be seen in our historic survey of sponges mentioned in Greek literature, have been the most important, not only in ancient times but are practically so at the present time. They are situated generally in the Aegean Sea, the Gulf of Salonica, the Dardanelles, the Sea of Marmora and the Bosphorus. The greater centres are the Cyclades and the Sporades Islands, near the islands of Rhodes, Cos, Symi, Calymnos, Samos, Patmos, Hydra, Kranidi, Aegina, Cyprus and Crete. The sponge beds of this entire region are less prolific than formerly, and this is no doubt due to the employment of the diving machine. Considerable mortality is ascribable to the use of the Scaphander or diving apparatus, but it has become absolutely necessary to use it in order to keep up the supply of sponges, so enabling the workers of this very large industry to earn a decent though difficult living.

Many of the best sponges are found in crevices, caves, and under over-hanging rocks, which abound along the shores of the various islands above named, and are inaccessible to other methods of sponge fishing. Sponges so obtained are found to be dense and fine.

A very large number of vessels under the Greek flag employ many thousands of men in the sponge fisheries.

The Commander of the Greek hospital ship *Kreta* estimated that the value of sponges taken by Greeks so far back as 1902 in various districts of the Mediterranean amounted to £200,000, but this is too low an estimate by far of the real value of the cargoes brought

MEDITERRANEAN HONEYCOMB
GROWN ON ANCIENT WINE JAR

to the various ports and depots, and these could not be ascertained until they had been thoroughly examined by experts.

The sponge fisheries of Crete, which are very important, are carried on entirely by fishermen from other Greek islands, who arrive in the spring and return in the autumn to their native places with their catches. The use of the scaphander was prohibited in the waters of this island in former times, but it is in use now.

Very good sponges are obtained from the beds which

surround the islands of Cyprus. In May, 1907, a new bed was discovered stretching off Port Said towards the north-east for a distance of about fifty miles. The fishermen who exploited this bed came from the Greek islands. Very good sponges are also found all along Syria, hence the French description of the beautiful fine Turkish variety known as *Fine Syrie*. These sponges are both of the cup and solid Turkey description.

The sponge beds off the Egyptian coast extend from the vicinity of Alexandria to the Tripolitan frontier and are continuous. Adjoining are the sponge grounds which reach along the coast westward and beyond Benghazi. Those sponges which are named after the latter place and Mandruka are looked upon as the very finest produced by the sea. This applies especially to the honeycomb variety.

The sponge beds of Tripoli have been under the sway of the Italian Government since the Italo-Turkish War. These beds extend between the Gulf of Bomba and the region about Benghazi, and from Misrata to the frontier of Tunis. Some of the sponge banks extend as much as twenty miles from the shore, where their quality is found to be better than that of the sponges found nearer the coast.

The fishery season is from April to October, but a few of the more hardy crews of divers work at other times in the vicinity of ports offering safe refuge in bad weather. The Tripoli grounds, which are situated between Tunis and Misrata, have Tripoli as a centre and market-place, and were first exploited on a fairly large scale about 1889. The scaphander vessels are numerous here and are all Greek. The trawlers or dredgers are principally Italian. During the time of active fishing, the Greek Government formerly maintained at

Tripoli a shore hospital and a hospital ship for the benefit of the divers and sailors meeting with accidents or injury by the reckless use of the diving apparatus.

Various licences are paid for the privilege of fishing by the boats. The value of these sponges is not so great as that of those from further east of the same coast, that is to say, Mandruka and Benghazi, the sponges being darker in colour and inferior to those obtained in the last-named locality.

The Tunisian sponge beds lie between Bibau Sarsis near the Tripolitan frontier, surrounding the Islands of Gherbis (hence the name of Gerby given by the French to the honeycomb sponge from this neighbourhood, which is a very tough and hard kind of honeycomb, unsuitable for the toilet and therefore employed chiefly for cleaning purposes), in the Gulf of Gabes, in front of Sfax, about the Kerkennah Islands and along the coast in front of Monastir and Susa. All known methods of sponge fishing are employed in these waters, i.e. wading, naked diving, harpooning, dredging and diving with the scaphander. The seasons vary with the methods employed, naked diving and harpooning being carried on in general from October to January, this season being the time when the bottoms are cleansed of vegetation and the sponges are plainly seen. The use of the scaphander and the dredge is physically possible throughout the year. Wading is practised by natives only, especially those of Kerkennah and Gherbis. The harpoon is employed by natives, Sicilians, Maltese and Greeks. The dredge is used by Sicilians and Greeks, while the latter alone employ the scaphander. Many of the native sponge fishermen sell their catch naturally in an uncleaned condition (*pèche noire*), but the foreign fishermen clean their produce (*pèche blanche*) before selling it.

Before the end of the last century a great revival of the fisheries near the Islands of Lampedusa stretching south and south-west for a long distance, and also those near Pantellaria, took place. The amount fished was very considerable, and after the beds had become depleted to some extent, they were left alone. The Italians used harpooning and dredging processes chiefly, while about half of the Greeks employed the scaphander.

## CHAPTER V

### METHODS OF FISHING IN MEDITERRANEAN

Wading—Naked diving, modern naked diving (illustration)—Harpooning (illustration)—Trawlihg, " Gangava "—Machine diving, " The Scaphander " (mention is made in a succeeding chapter, entitled " Florida Sponge Fishery," in which this subject is dealt with fully).

THE methods employed in fishing for sponges in the Mediterranean are essentially the same as those employed in Florida, with the addition of naked diving. The same methods are also employed in the great Bahama fisheries, excepting the use of the diving apparatus.

**Wading** was probably the first method of sponging used in the Mediterranean, but with the practical extermination of the sponge in shallow waters it has disappeared as a feature in the fisheries, except in a few places along the coast of Tunis. The natives of Gherbis and Kerkennah obtain some sponges in the same manner, wading to their necks in the water when the sea is smooth, detaching them with their feet and kicking them within reach of their hands, and occasionally diving for them. The sponges are, as aforesaid, inferior in quality.

**Naked Diving** is another ancient method. It is the early method of diving so eloquently described in prose and verse by the ancient Greek writers. It is practised principally by the Greeks of the Archipelagos and Syrians. It is commonly reported and believed by some that the most skilled divers come from the islands of Calymnos and Symi, and that some of them

THE THREE PRINCIPAL METHODS OF SPONGE FISHING

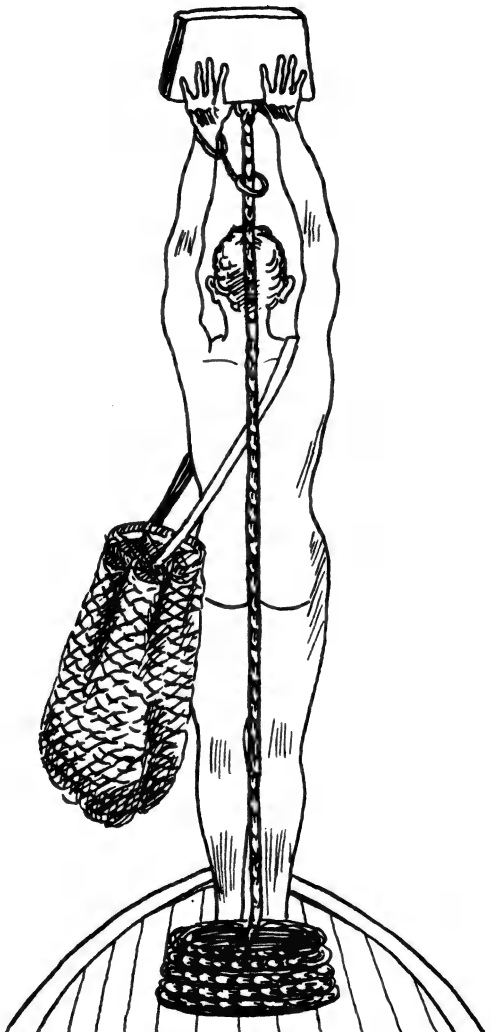
Boat on right, trawling; centre boat, diving with apparatus; boat on left, naked divers

can descend to the enormous depth of 250 ft. If this be true, it is far in excess of the depth reached by divers in the scaphanders, as they do not exceed 200 ft.; they ordinarily remain under water from one to two minutes, resting about thirty minutes between dives; but experts sometimes stay down for three minutes.

**Diving.** The ancient divers held a lead weight attached to a cord which was held by a man in the boat carefully in his hand so that he could feel the pull of the diver immediately he wanted to rise to the surface. The sea-bottom being reached, holding on by the rope, the diver gathered what sponges were within his reach, which he deposited in a net bag that was attached to his body.

**Modern Naked Diving.** The improvements effected by the experiences of the past are taken advantage of by the divers of the present time. The stones are shaped as indicated in the drawing, and by holding them in certain directions the diver can reach the bottom at the spot where the sponges have been sighted. This apparently simple improvement has resulted in great benefit to the collecting of sponges.

Despite the arduousness of the work, the divers are able to follow it for years, as they are hardened by training from boyhood. They are therefore never attacked by the serious maladies to which machine divers are subjected, but, owing to the brevity of their stay under water and the length of the intervening rests, they cannot work over such a stretch of time as the machine divers, and their working time is short. It is obvious that this method of sponge fishing is best suited to an uneven bottom, too rough for a dredge. The sponges secrete themselves in crevices or under overhanging ledges, which make them invisible to the ordinary harpooner, and also in places where the reefs



MODERN SYSTEM

Diver with shaped stone, rope attached to stone and to his body by means of connected rings fastened to his wrist and to the rope

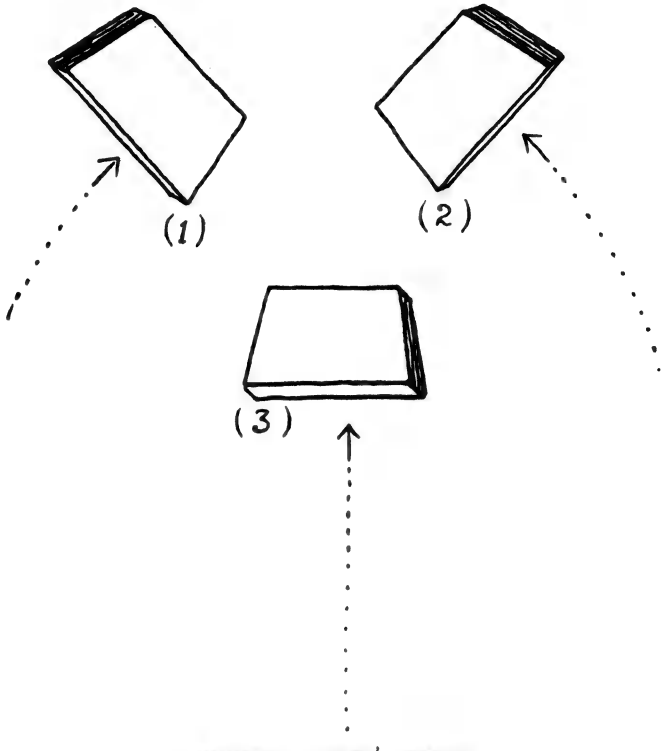
are so sharp as to make the use of the diving machine dangerous, both as regards the air-tube and the diver's dress. This method of diving is usually carried on from small boats, the crews being paid stated wages, while the diver works partly on wages and partly on a sharing-out principle, as is explained more fully in a following chapter.

**Harpooning.** Historically speaking, this is the third method of sponging, and has been used in the Mediterranean for many centuries. It is still employed on nearly all the sponging grounds where the water is not too deep. The ancient and modern instruments employed are very much of the same pattern, the ancient being a trident with one handle and having three points, whereas the modern is a far more effective instrument for it can be lengthened by additional handles so that it can reach four or five times the depth of the old instrument. The number of points varies also. The Tunisian Fouchgar has two barbed points, the Sicilian Fuscina has three points, the Greek Kammaki has four, while the Dalmatians use a three-pointed instrument. These all have the tines straight instead of curved as are those used in Florida and the Bahamas.

The water telescope is merely a bucket-like instrument with a glass bottom, which breaks the angle-producing characteristic of water when looked at from above. The harpooner looks through this water glass while bending forward with a cushion placed under his chest over the bow of the boat to scan the bottom.

When the Greeks go to the fishing grounds, which may be a week's sail from their own port, they are convoyed by a depot boat in which they live, and to which their catches are transferred when opportunity offers.

Owing to the sponge being torn or rent by this method of harpooning in the process of fishing, the sponges




MODERN DIVERS' STONES

Stones used by diver, who, by holding them in the positions shown, can direct himself (1) to the right, (2) to the left, (3) in direct line with his boat; the distance he attains being in proportion to the angle at which he holds it

taken are less valuable than are those obtained by diving.

Another curious instrument occasionally used on the Dalmatian coast consists of a pair of tongs, one leg of which is attached to a pail and the other operated by a cord.

**Trawling.** A trawler is of large size, and has been used for many years by the Greeks, Sicilians, Neapolitans and Maltese, on the coast of Africa and the banks of Lampedusa. A part of the frame which scrapes the bottom is a round iron bar of about three inches in diameter, the ends being bent at right angles for a distance equal to the desired height of the frame, and connected by a stout wooden bar to form the top. The ends of the frame are frequently made by short wooden bars fitted into sockets in the upturned ends of the iron bar.

The trawl can be employed on smooth bottoms only, as the frame is liable to foul, and the net to be torn on rough rocks, but it can be used at all seasons of the year and in all ordinary weather. It is much complained of for its destructiveness, the charge being made—with apparent justice—that it tears loose or crushes all sponges in its path, both large and small, and that not only is a considerable portion of the catch inferior, on account of the small size, but that many sponges are torn loose and not brought up at all, being left to die on the bottom or to become rollers. In some localities the Gangava (or trawl) is prohibited in depths of less than a prescribed minimum. In Egypt the limit is fixed at 80 metres and in Cyprus it is entirely prohibited. It is used principally on the African coast and on the banks of Lampedusa. This method is discussed fully in a succeeding chapter entitled the Florida Sponge Fishery.

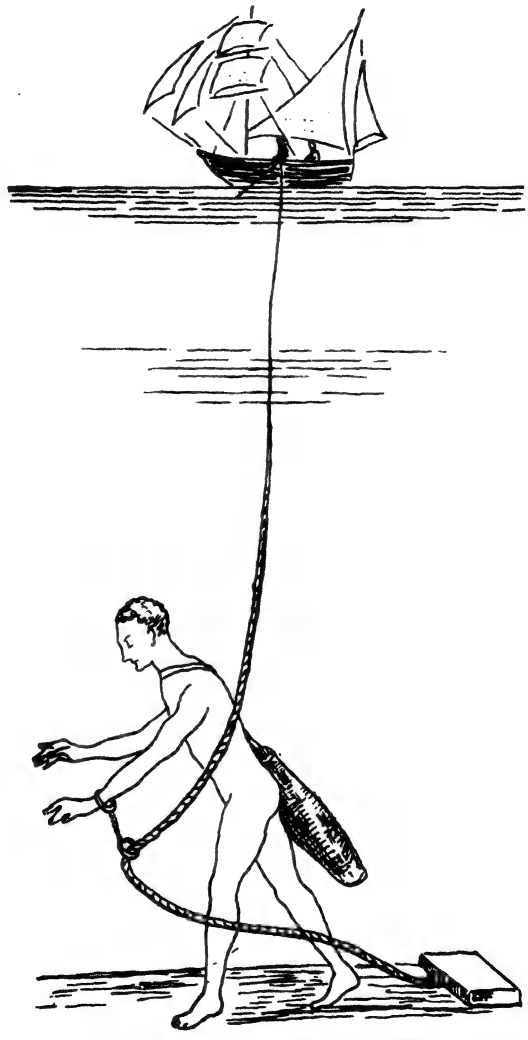
KAMAKI : ANCIENT TRIDENT OR SPONGE HARPOON

MODERN SPONGE HARPOON (WHICH CAN BE LENGTHENED AT WILL)

**Machine Diving.** The scaphander was introduced into the Aegean Sea and the Levant about 1866, and at once came into such general use among the Greeks that ten years later about 110 machines were in active service.

From the time of its introduction, the diving dress has met with active and sometimes violent opposition from the spongers using the older methods. During recent years it has been opposed on hygienic grounds, and, since 1892, mainly through the efforts of Mr. Chas. Flegel, its use has been prohibited in Austria-Hungary, Egypt, Crete and Samos. Turkey also passed prohibitive laws, but they were not enforced and have been repealed, and the interdiction formerly existing in Cyprus has been removed. Italy and Greece have placed restrictions on the depths to which the divers may go, but this law is more or less ignored. The Greek regulations prohibit all diving at greater depths than 127 ft., and, until recently, regulated the period for which the diver could remain submerged at various depths.

Some divers are injured or killed by accidents to the diving dress or hose, but the chief danger to which they are exposed is Caisson disease, which is a frequent consequence of working in depths of over 60 ft. This malady is caused by the absorption of gases of compressed air and their release as bubbles in the blood vessels and tissues upon decompression, especially if the latter be rapid as in the quick ascent of the diver from the bottom. In Caisson work rapid decompression is guarded against by gradual transition from higher to lower compression in the air locks, or in carefully regulated diving with the scaphander by slow ascents ; but in sponge diving these precautions are ignored, with the result that many of the divers become paralyzed



DIVER ON SEA-BOTTOM

Diver at work, showing how he can walk around the stone, while not displacing it

and a considerable number of them are killed. Flegel states that the average yearly mortality among the Mediterranean divers reaches the almost incredible proportion of nearly 20 per cent, and the cases of more or less serious illness of nearly 25 per cent, but these percentages are greatly exaggerated by this idealist, who allows himself to be carried away by his enthusiasm.

The fishing by diving apparatus is mainly in the hands of Greeks from both the Grecian and Turkish islands.

## CHAPTER VI

### SPONGE FISHING IN THE BAHAMAS

SPONGE fishing in the Bahamas dates from about 1841, when the value of the native product was recognized by a French sponge merchant who was wrecked in the vicinity of Nassau, the capital, and who shipped a sample lot to Paris. The author has met a relative and subsequent partner of this merchant, and was in intimate relations with him for many years. This gentleman had lived for a number of years in Cuba and in the West Indies generally, and his perfectly wonderful knowledge of Spanish assisted him greatly in the carrying-on of his sponge business. He directed his business from Paris, where the author was born—of British parents, of course—and where the acquaintance of the merchant referred to was strengthened into friendship.

The author's acquaintance with the Bahamas came to him at an early age, owing to the fact that his uncle, Mr. Edward Brown, who was a member of the Bahamas Legislative Council, was resident there for many years, and shipped the largest quantity of sponges exported from the Bahamas at that period. He ultimately died there.

The trade in sponges on the Bahamas has steadily grown for many years until, shortly before the Great War, it had attained the large quantity of nearly 2,000,000 lbs. annually.

**Sponges: Their Importance to the Bahamas.** (From particulars officially supplied by the Board for the protection of marine products.) The sponge trade has been called the backbone of the colony, and if it were

not for the continuous influx of sponge from the marine gardens of the Bahamas our commercial standing would be insignificant. However, the sponge is the one inexhaustible product of the Bahamasian waters, and it has gradually won its way to the very first place in our exports.

Fifty years ago the sponge trade was but a small item in our accounts. The business was carried on by a few independent dealers who bought sponge from itinerant fishermen and slowly and laboriously prepared them for export. The catch was small because there was no capital to exploit the large sponge fields, nor was there the incentive, as the prices paid were far from attractive to the sponger.

As sponges became better known, the demand increased. The low prices induced merchants abroad to speculate, thereby commencing to displace the high-priced Mediterranean goods. With the increased demand better facilities for fishing were employed. Larger vessels began to make sponging voyages, articles were signed and "outfitting," which means the advancing of provisions for the vessels and a certain amount of money for the crew. It thus became an organized trade and considered an industry.

A company was formed and an exchange built where sponges are sold by sealed tenders to the highest bidder. Sponges are landed here, and each lot is registered by brokers, giving their own initials to indicate who are the sellers. Slips of paper, on which are recorded each lot for sale, are handed to the respective buyers. The buyers examine each lot, judge their values, and then place the amount of their own estimation opposite each lot. These slips are then returned to the broker who, after comparing them all, declares the lot to the highest bidder.

There are several great sponge fields in the Bahamas and many minor ones. The former are "The Mud," a shoal with a peculiar marl bottom, 64 miles wide and 200 miles long, located to the south of Andros Island between Santarem Channel and the Great Bahama Bank, having the Gulf on the east. From this field sponges are harvested in amazing quantities. In the month of December, 1915, 1,500,540 Wool and Velvet sponges were offered for sale, all of which were hooked from "The Mud." The Grass sponges hooked at this time amounted to ten times this quantity, to say nothing of Reef, Yellow, Hardhead and Glove sponges.

The next largest field in productiveness, if not in extent, is the "Abaco Bight," which produces a much finer grade of sponge than "The Mud," the Wool, Velvet and Grass sponges here obtained being much more closely woven and extremely smooth and tough. This bed is 138 miles long and 50 miles wide, though in parts it is but 10 miles wide.

"The Current Beds," lying off Eleuthera Island, represent the next in size to "The Mud," and are famous for their fine variety Wool which is very valuable. The great depth at which these beds are situated makes fishing very difficult, as spongers have to use poles 35 to 40 ft. in length.

"The Exuma Fields" are 155 miles by 96 miles, and "Acklins," where the finest variety of Bahama sponge is grown, is but 33 miles by 23 miles.

The minor beds are "Bimini Banks," "Bahama, or the Westward," "Southern Mud," "South Side," and many others too numerous to particularize, but where excellent sponges are found though in small quantities.

There are seven varieties of sponges in their respective order of value as follows: Wool (*Equina gossipina*),

Velvet (*Meandriformis*), Reef (*Tubilifera*), Hardhead (*Dura*), Yellow (*Colosia*), Grass and Glove.

Sponges are fished in the following manner: Two men set out in a boat, one is the oarsman, technically called the "sculler," the other fishes the sponges and is called the "hooker." The latter carries a water-glass, which consists of a bucket with a glass bottom through which sponges can be easily seen at any depth, and a long staff with a pronged hook at one end. When a sponge is located (a sponge growing in the mud does not expose more than one osculum or two), the hooker signals with his hand and the sculler brings the boat to a standstill. The hooker then lowers the staff and by a dexterous movement of the wrist inserts the hook in the roots of the sponge and wrenches it free from the bottom. A law which is strictly enforced prevents the gathering of sponges in any other way than that described here.

When first taken from the water, the sponge presents a very different appearance to when it is seen on the dealer's counter. The entire body including the canals and osculums, are coated with a fine, black gelatinous substance. This is the flesh of the invertebrate and has to be removed before the sponge is fit for market. The process of cleaning takes from five to eight days. The sponge is allowed to die on the deck of the vessel and is then thrown into a "crawl," an enclosure made of stakes in shallow water. There the natural process of decay ensues, and the flesh drops from the fibrous skeleton and is carried off by the tide flowing through the enclosure. In a short time the sponge is ready for beating and the spongers, armed with "gluts" (short thick clubs), spring into the "crawl" and pound the sponges vigorously, thereby expelling all the disintegrated matter in the pores of the sponge. This

**SPONGE YARD IN NASSAU**
Clipping and trimming sponges by natives

thorough beating is very necessary, as an improperly cleaned sponge is nearly worthless in the market. The buyers are very keen about " dead meat," as it is known to the trade, that is to say, portions of black jelly remaining in the centre of the sponge, not discernible to the untrained eye, but which is quickly detected by the expert, who will shun the sponge containing it.

When thoroughly cleaned, the sponges are stored in the hold of the sponging vessel and brought to Nassau for sale. The sponger's troubles are, however, not yet ended, for if the stowing is too compact, or the sponge too moist when stowed away, they are likely to become heated and rotten. Should the vessel experience bad weather and the sponges get wet with rain water, they would unless promptly dried, turn red and materially depreciate in value.

In 1904 a Government Board was formed for the protection of marine products. The chief object in view, however, was to preserve the valuable sponge species, which were threatened with extinction by careless and indiscriminate fishing. This Board has done much to protect the sponge beds from depletion. Certain areas are closed to fishing for years at a time, thus giving the species opportunity to thrive and increase undisturbed.

The Board also restricts the fishing of certain small sponges, so that a sponger is penalized who gathers sponges under the size mentioned in the Board rules.

The Board has also engaged in sponge culture, and at Exuma and Acklins they have small cultivations which are progressing very favourably. The secretary, Mr. H. C. Christie, has invented a disc which he uses exclusively in his planting operations. This disc is non-reversible, that is, it cannot turn over when thrown into the water and requires no support for the sponge.

By a contrivance made on the disc, the cutting is attached directly to the disc and need never be reset again, as the grown sponges can be removed in such a way that, although the sponge is not injured, a bit of it is left on the disc, and will grow into a new sponge.

The sale of sponges has increased rapidly since the Board was formed in 1904. In 1919 the sales amounted to £110,560. In 1907, the first year in which the Board took statistics, the sales were, exclusive of the returns from the "Abaco Bight" which had been closed for three years, not quite £79,000, while the best year, 1917, equalled £152,282.

The latest statistics compiled by the Board show that 2,535 vessels and boats of all kinds are employed in sponging, the crews of which number 4,040 men and boys.

## CHAPTER VII

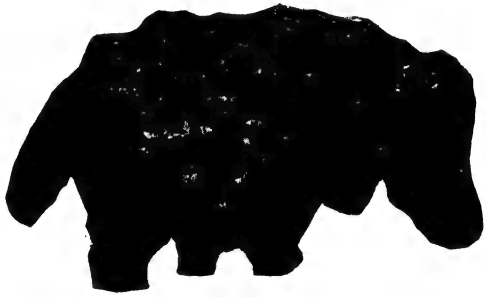
### SPONGE FISHING IN CUBA

THE sponge beds in Cuba lie principally on the north coast, and certain parts of the south coast. The productive beds of the north coasts are amongst the Keys, between Cardinas and Nuevitas. These were known before the discovery of the Batabano grounds, and were worked by the Bahama spongers under licence from the Spanish authorities. The sponges are found in shallow water within and about the line of Keys which skirts the Nicholas and Old Bahama channels, opposite the important beds of the great Bahama Bank. This region is the source of practically all the Cuban Reef, Hardhead and Silk Grass. Sheepswool from the north coast are stronger and better than the products of the south coast. Some of the Sheepswool sponges fished in these waters suffer but little in comparison with the vaunted choice products of the Florida Keys, and are as valuable as some of the rougher Mediterranean sponges. The centre of this fishery is Caibarien.

Very important beds on the south coast lie in the vicinity of Batabano, between the Island of Pines and the main island, from Cayos de Felipe to Cabeza del Este. Numerous small islands, Keys and rocks are dotted over this region where the bottom is less than three fathoms generally, and in some places there is a maximum depth of six fathoms. Outside the banks in the Caribbean Sea the bottom slopes suddenly to profound depths. The grounds off Batabano were discovered in 1884, and an attempt was made to monopolize their exploitation. Fortunately the attempt was

frustrated and the fishing was made open to all fishers.

**Methods of the Fishery.** It is instructive to know that experiments with the scaphander and naked diving were tried, but they both proved either expensive or inefficient. A kind of grapnel dragged over the bottom, the method of hooking essentially similar to that practised in Florida and the Bahamas, finally became established as the most satisfactory and effective.



CURIOUS GROWTH OF CUBA SHEEP WOOL

It is the method now generally employed, though a few sponges in the shallower waters are taken by wading.

**Sponge Fishing in British Honduras.** About 1895 a special concession for a duration of two years was granted to the firm of Cresswell Brothers, of London, by Act of the British Honduras Parliament. As soon as the necessary arrangements were completed, the above-named firm sent over a number of Greek divers and fishermen to Belize with all the apparatus necessary, except the boats, which they obtained on the spot. The object of the concession was to thoroughly investigate the coasts of the colony and the adjacent

waters, the firm being entitled to the value of all the sponges that were fished.

By far the largest quantity of sponges so obtained were of the Velvet type but somewhat hard. Other kinds were found, but in insufficient quantities to repay the use of the diving apparatus. This expedition worked for nearly two years, and went as far as Yucatan and Cozumel Island. After charting out the waters and packing up the large quantity of sponges accumulated, the expedition returned to Greece via New York. It was under the direction of Mr. George Brown, a cousin of Messrs. Cresswell, a resident at Aegina, Greece, who has lived there as their agent for so long a time that he has become as Greek as any of the Greeks themselves. He is the only Englishman resident on the island.

## CHAPTER VIII

### THE FLORIDA SPONGE FISHERY

THE three kinds of Florida sponges best known to the English market are the *Sheepswool*, the *Grass* and the *Yellow*. The first has but little sale in this market, as it is found to be too high in price in comparison with the Mediterranean sponges of similar characteristics. Sheepswool has larger osculae than the Honeycomb, and it is not so durable. The first sponge fishers in Florida were settled at Key West in 1822, and the early inhabitants soon learnt, probably from the specimens thrown up on the beaches of the Keys, of the presence of several species of useful sponges in the surrounding waters. It is known that long before these became an article of commerce they were in use amongst the inhabitants, but it was apparently not until 1849 that they were given a commercial value. Before this time the entire sponge supply of the United States was obtained from the Mediterranean, and gradually the sponges from the Bahamas were introduced into the market, but the supply was in small quantities at first.

**The Sponging Grounds.** The sponging grounds are broadly divided into two widely-separated areas, the "Bay" grounds, lying in the open waters of the Gulf of Mexico, and the "Key" grounds. That there is a sponge-bearing bottom between the new grounds off Cape Sable and the mouth of Tampa Bay admits of little doubt, but notwithstanding that the fishing boats have traversed that region year after year in going to and fro from the Bay grounds, practically no sponges

have been taken there, owing mainly to the depth and almost constant turbidity of the water. A few spongers have reported seeing sponges but never in considerable quantities.

The grounds as exploited and worked by the hookers up to the time of the introduction of the diving apparatus in 1905 covered an area of 4,350 sq. miles, of which the " Bay " grounds obtained about 3,400 and the " Key " grounds about 950 sq. miles.

Sponges grow neither on sand nor mud, nor primarily on grassy areas, but must have some firm, clean body to which to attach themselves when the small free-swimming larva is ready to settle down and assume its final fixed position and form. Among the Keys, the bottom mainly consists of sand, and more or less of calcareous mud or marl, either bare or, less frequently, supporting a grassy growth; while on the " Bay " grounds it is generally sandy with more or less grass in the shallow waters close to land. In the channels and other places among the Keys where the currents run with sufficient velocity to scour the bottom, or the waves prevent the excessive deposit of silt, the coral rock is exposed and furnishes attachment to sponges. In the same way, on the " Bay " grounds the bottom is denuded by currents in the channels, as at the north end of Hog Island, and on the " Buoy " grounds above Anclote Quay, while off-shore there are rugged outcroppings of rock rising above the surrounding sand. It is upon these " spots of bar," as the spongers call them, insignificant in area as compared with the adjoining stretches of sand and mud, that the sponges occur in greatest abundance, attached to the rocky floor of the sea.

Occasionally they grow on sea feathers, which in turn are anchored to the bottom or on mangroves;

and considerable numbers are often found in the grass or in saucer-shaped sandy depressions surrounded by grass. Their occurrence in the latter places apparently contradicts the statement that they do not grow on grass or sand, but the contradiction is more apparent than real, as they have been in all cases originally attached but, either in the operation of sponging or by wave action, have been torn loose and, rolling freely over the bottom at the mercy of the waves, have finally been entrapped in the tangle of vegetable growth. Such sponges are generally almost spherical, have no "root," and the surface is uniformly smooth from friction on the bottom and harsh from the excessive inclusion of sand grains. They are known as "rollers" or "rolling johnnies," and are often found in groups in sandy depressions, in grassy bottoms called "turtle sets," from the erroneous supposition that these depressions are made by turtles.

**Bay Grounds.** The "Bay" grounds, which formerly held a secondary place commercially, now yield practically the entire production of Florida sponges, the "Key" grounds furnishing hardly 9 per cent of the Sheepswool sponges and less than 13 per cent of all kinds. The "Bay" grounds begin near Tampa Bay, and extend as far as St. Marks, a distance of 160 miles. As was known at the time of the introduction of the diving apparatus, this ground extended from a depth of 10 or 15 ft. to from 7 to 12 fathoms, 20 to 40 miles from shore, but although the sponges have been seen in the greater depths, no sponging had been done in more than 8 fathoms, owing to the limitations imposed by the methods employed. Grass and a few Sheepswool sponges were taken in less than 10 ft. of water, especially in the early days of the fishery, but the bulk of the product was from between 20 to 40 ft., though in 1902,

owing to unusually favourable conditions, a heavy catch of fine sponges was made in water as deep as about 48 ft. Several persons have reported seeing sponges in 20 fathoms, and it is stated that, on at least one occasion, a sponge was brought up from 17 fathoms on a fish-line. Since 1905 the operations of the divers, who have gone as deep as 110 ft., have slightly extended this area, and as that method of sponging becomes older, and the shallower waters more exhausted, it can hardly be doubted that productive ground will be found in the greater depths. Should the " Bay " grounds be found to extend to a depth of 15 fathoms, about 3,700 sq. miles would be added to the area of sponge bottom, while if they prove productive to a depth of 20 fathoms, there would be added to the area developed by the hookers no less than 5,900 sq. miles, making a total of about 9,300 sq. miles of sponge-producing bottom, between Johns Pass and St. Marks, inside of the 20-fathom curve.

The bars, especially in the shallower water, are sometimes moderately level expanses, but are generally rough and rugged with fissures, clefts, crevices, miniature precipices and overhanging ledges, in all parts of which the sponges grow like lichens clinging to the rocks, sometimes exposed to view from above, often hidden in semi-dark recesses, on the sides of upright walls or beneath projecting ledges. They are mingled with non-commercial sponges of many species, with sea feathers, sea moss and coral ; and surrounded by a wealth of life—fishes, mollusca, crabs, shrimps and other crustacea of bizarre shapes and brilliant hues, star-fish and sea-urchins of varied form and sea cucumbers, some permanently attached to the rocks and others free to wander, yet finding on the bars rich feeding ground, oases in the vast desert of sand lying round about.

Compared with the total area of the sponge grounds the extent of these bars is small, nobody can say how small relatively, but it is from them, and practically from them alone, that the supply of sponges must be drawn. Their distribution is irregular in different sections of the ground and in different depths ; sometimes there are great areas of white sandy bottom, quite devoid of rocks, and again the bars are comparatively closely approximated over a wide range.

**Rock Island Region.** The region so designated, taking its name from a small island about 22 miles to the eastward of St. Marks Light and as developed by the hookers, had an area of about 800 sq. miles, about 50 miles of which, forming a strip of 2 miles off shore, yields Grass sponges in considerable numbers. Inside of the 5-fathom line the Rock Island beds produce Sheepswool sponges in great abundance, though most of them are comparatively small. When first discovered, the sponges were larger ; but owing to the intense fishery in the shallow waters they now have no opportunity to grow, if, indeed, their size has not become permanently impaired by the persistent and constant picking out of the larger ones, as appears to be the case in Sugar Loaf Key also.

The Sheepswool sponges of this region are of fine quality, close and tough of fibre, of very convenient shape for the toilet or bath, being of loaf shape and conveniently held in the hand. They are of good colour, and bring a higher price than any American sponges; in fact, they may be described quite fairly as being the most valuable of all sponges that come from these waters.

**Anclote Region.** Practically continuous with the preceding ground and also the following, the Anclote Region extends from St. Martin's Reef to about Big

Pass, and, as known in 1905, covered an area of about 290 sq. miles. At that time the depth in which the sponges were found extended from about 4 or 5 fathoms to about 8 or 10 fathoms; but the divers have, since then, taken large quantities in from 10 to 15 fathoms, and a few boats are said to have worked as deep as 18 fathoms. The finest quality of Grass sponge known in Florida, as well as Sheepswool and Yellow, come from this region.

There are many other Keys and Lakes, some of which form very long and practically continuous sponging grounds.

**Hooking.** The sponge fishery was carried on by wading in the shallow waters adjacent to Key West, the sponges being pulled by hand. Later the sponge hook was introduced, originally a two-tined sharp hook attached to a pole of moderate length, but latterly the number of tines was increased to three, the type now universally employed. With the introduction of this implement slightly deeper waters were explored, the fisher standing in the bow of his boat, closely scanning the bottom for sponges and tearing them up with his hook as soon as discovered. To calm the ripples which interfered with their view, the spongers soon learnt to make use of oil. The oil is usually carried in a wide-mouthed bottle, and is sprinkled on the water in small quantities by means of a stick or swab.

This method of sponging is still followed in the vicinity of "Key West," and among the "Keys" where the depth does not exceed 5 or 6 ft., two or three men, each with a dinghy, cruise about on little sloops, cooking, sleeping and living, and to some extent curing their sponges, in the most contracted of quarters.

## CHAPTER IX

### SPONGE DIVING IN THE GULF OF FLORIDA

PRIOR to 1905, Messrs. E. J. Arapian of Key West and John K. Cheyney of Tarpon Springs, had each experimented with diving apparatus without material results. In the spring of this year, John Cocoris, a Greek, became convinced that the methods employed in the Mediterranean could be successfully employed on the Bay grounds. With the financial assistance of Mr. Cheyney he got together at Tarpon Springs men and material for the experiment. With the aid of some of his countrymen who had had experience in the sponge fisheries of the Mediterranean, he remodelled a small sloop to suit the purpose of a machine boat, and in April of that year succeeded in obtaining a large quantity of good sponges.

After this success, diving boats were built in New York and New Orleans, and some were even brought from Greece. By May, 1906, there were fifty diving boats at work and fifty-five more awaiting crews. In the beginning the crews were paid wages, which, under the competition for skilled men that developed, rose rapidly until the divers were receiving as much as $300 per month. The old system of advances or bounties, which had been the bane of the vessel owners during the pre-eminence of the hookers, was introduced on the diving vessels, and the owners competed against one another for the best men and even those of little experience and ability.

These facts soon became known among the Greeks, and there was a heavy influx from New York and a considerable immigration from Greece, until within the

year there was a Greek colony of about 800 at Tarpon Springs. A few Americans also engaged in diving, but were less successful than the experienced Greeks and gradually dropped out of the business.

The number of outfits by the middle of May was about fifty. The yield from 1st January had been no less than $250,000 and about $20,000 worth was coming in weekly. Under this heavy supply the price broke sharply and sponges which would have brought $8 to $10 per bunch in February were selling for $2.75 to $3 in May. Under these conditions the high wages of the earlier trips became prohibitive and the divers were placed on shares, their pay then being dependent upon their own skill and industry. Boats of the Greek type were speedily introduced and are now almost universally employed.

**Diving with Apparatus.** Boats commonly used by the Greeks in machine diving are "double enders" with high bows and sterns and considerable shear, making them good, dry sea boats in any weather, either under way or at anchor, and they are spritsail rigged. More recently gasoline engines have been placed on many of the boats at work in Florida, the propellers being guarded by cages to prevent fouling of the hose or lifeline, an accident which might prove fatal to the diver at work. The machine boats are also provided with two pairs of stout crutches, to which the sweeps are slung by rope loops or grommets, and on each side amidships is a rail about 18 ins. high with a sackcloth curtain or screen stretching to the gunwhales. When not in use the oars or sweeps rest fore and aft on the crutches. On the starboard side forward is a heavy ladder, hinged so that it can be swung outboard, or stowed inboard as required and of sufficient length to extend 2 to 2½ ft. below the surface of the water. This

is an essential feature of the machine boat, as without it the diver in his heavy cumbersome armour could only be brought aboard with extreme difficulty. The Greek boats have each a circular hatch forward in which stands the man using the water-glass. The machine boats of the Greek type are about 32 ft. long and about 11 ft. beam on deck. Fully equipped with a good pump and gasoline engine for propulsion, they cost about $2,000.

The pump is of the usual type employed in diving operations. It is placed amidships in the boat and when not in use is covered by a hatch to protect it from the weather. The diving dress consists of a helmet, breastplate, shoes and weights. The suits are of double waterproof cotton cloth with rubber between, and completely cover the body, with the exception of the hands, a close-fitting rubber cuff being provided at the wrists and a heavy rubber collar or yoke extending across the breast, back and shoulders. The helmet is of tinned copper with three heavy glass windows at the front and sides and one obliquely above in the front. At its back are two valves, one with a connection for the hose and the other for the discharge of vitiated air. In some helmets the latter valve is automatic, but few of the Greek divers will use this, preferring those in which the escape of air from the helmet is regulated by the diver, the valve being held in place by a spring and released by pressing against it with the back of the head. The fresh air is conducted in flat tubes from the intake towards the front side of the helmet, serving the double purpose of supplying unvitiated air for respiration and preventing condensation on the window. The hose is of the best quality, covered with a canvas jacket to protect it from abrasion and with tight screw couplings between the sections, the weight of the unions

being compensated for in the water by cork floats. The rest of the hose is of itself sufficiently buoyant when full of air.

In preparing to descend, the diver puts on heavy woollen underclothing and stockings, and thoroughly soaps his hands and wrists to permit pulling on the rubber cuffs and to secure close contact at the wrists. With assistance he then crawls into his suit ; the breastplate, covering the upper part of the breast, back and shoulders, is inserted inside of the rubber yoke, which is provided with eyes fitting over corresponding screw lugs on the breastplate and the two are clamped to a watertight joint with thumbscrews and brass straps. Stout weighted leather boots, brass or lead soled and tipped, are then securely strapped on the feet. In the meantime the interior of the helmet has been washed and the air supply tested by placing water in the helmet to determine whether the air bubbles freely through the intake valve when the pump is operated. The pump is then started slowly and the helmet secured to the breast by an interrupted screw, the joint being made watertight by means of a rubber gasket. The helmet is then lashed to the breastplate, the front and back weights of lead are lashed on, the hose brought under the left arm and lashed to the waist and the lifeline is fastened tightly around the body under the arms.

The diver is then ready to descend, and, with his burden of about 200 lbs., is assisted to the side, where he either drops overboard or else climbs down the ladder, the pump being run more rapidly as needed to supply the air pressure commensurate with the depth in which the diver is working.

The crew of a machine boat with their stations when at work is as follows: The divers, some resting while the

others are at work; these men are always particularly abstemious as to food and drink, no alcohol being used and the daily meals consisting of a cup of coffee in the morning and a hearty dinner at night when the day's work is over. Three oarsmen ; the bow oars are pulled each by one man sitting down, but the stern oarsman stands facing forward and pushes two sweeps, which are balanced by heavy weights near the handles so as to reduce the fatigue of rowing. Two pump men and one relief who manages the hose when not pumping. One lifeline man, whose important duty it is to see that the lifeline is kept clear and that the signals of the diver are promptly regarded ; experienced and careful men are required for this station, as the efficiency of the diver's work and not infrequently his life depend upon intelligent communication between him and the boat. One hoseman, the relief from the pump, who pays out or takes in hose as the diver moves away from or approaches the boat ; a surplus of hose trailing out in strong currents impedes the diver in his progress over the bottom, and, should the hose become fouled or kinked, the supply of air may be cut off with possibly serious results. When moving from place to place the hose-tender relieves the stern oarsman, and the bow oarsman and pump men alternate at their respective duties, thus obtaining some rest. On boats run with gasoline engines there is sometimes in addition a man to run the engine.

The deposit or living boats are usually schooners, such as are commonly employed in the hook fishery, most of them between 10 and 20 tons register. They furnish the living quarters for the crew and a place of deposit for the sponges, most of which are cured aboard as done in the Mediterranean.

The diver at the bottom of the sea regulates the air

supply with two purposes in view—respiration and a proper degree of buoyancy in his suit. If all is working properly the suit is always more or less inflated, and in spite of the great weight of the man and his armour, 350 to 400 lbs. as weighed in air, he treads the bottom with a pressure of but a few pounds. Should insufficient air be liberated, the suit becomes still more inflated and its buoyancy will carry him to the surface, a method frequently employed in making ascent from moderate depths, but liable to produce serious hygienic consequences if practised under greater pressures. If the pump be working too rapidly or too slowly he gives the proper signal by jerking on the lifeline, and the supply of air is modified accordingly.

In moving over the bottom the divers do not walk as do persons on land, a thing impossible owing to their levity and the resistance of the water. Their movements are rather a series of headlong springs or dives upward and forward with the body strongly inclined. As the diver finds the sponges, he tears them loose and places them in a bag which, when full, he signals to have pulled up on the lifeline and an empty one sent down.

Siebe, a recognized authority, states that 150 ft. is the maximum limit for safe diving by physically sound men, and that the greatest diving feat known is a stay of 42 mins. in a depth of 201 ft.

The ability of the diver to penetrate to a depth beyond that accessible to the hooker is of value only if sponges extend into the deeper water. That this is the case to some extent has already been demonstrated, but there is as yet no indication that the beds extend to depths equal to those attained in the Mediterranean. The advantage in the efficiency of the two methods at

depths of 40 ft. or more, where the hooker is approaching his limit, is vastly in favour of the diver, who can work there in average weather, while the hooker can operate only under very rare combinations of favourable conditions.

## CHAPTER X

### SPONGE BEDS AND MODES OF FISHING

THE commercial sponges, where their beds can be fished by men, can never be depleted entirely. It is impossible so to denude the grounds as to leave none for reproduction, and where they become so depleted as to reduce the earnings of the fishermen to a bare living wage, the inevitable result is a reduction in the number of fishermen and the establishing of an approximate equilibrium between productiveness and the results of fishing. The point at which this equilibrium is established will vary, becoming lower with an increase in the value of the product and higher with an increase in the cost in the living of the fishermen. Both these conditions have contributed to the higher cost of sponges during the two later years of the Great War and the period that has elapsed since. Thus, while the sponges are never actually exterminated, there may be results amounting to commercial extermination, so that while the beds remain unvisited and practically abandoned, they soon recuperate and again become commercially productive. For instance, in the fishery tributary to the Benghazi market the only material variation in a period of five years can be traced to a difference in the intensity of the fishery, especially in the number of scaphanders employed. In Tunis, from statistics taken during a period of twenty years, the maximum yield has exceeded the minimum by about 25 per cent, and the last year of that period yielded a greater catch than any year previously recorded, with two slight exceptions. It is true that the number of fishermen

engaged and the number of boats employed has increased by about 33 per cent, with only a slight increase in the yield of sponges. It is difficult to say exactly to what this is due, as there have been changes in the regulations and methods of fishing, etc., but that the average catch per man is lower than in former years is an undoubted fact.

The products of the banks of Lampedusa have decreased materially since the fishery attained its maximum yield. In the Mediterranean the dredge and scaphander are both blamed for the depletion of the beds, but which supposition is correct it is difficult to say.

Strangely enough on the western side of the Atlantic, with the exception of Florida Gulf, neither diving machine nor dredge has been used. Hooks, the equivalent of the Mediterranean harpoon, were the only implements employed, and yet the complaints of lessening productiveness of the sponge grounds are quite as loud and apparently as well founded as in those regions where the scaphander is used.

The popular idea that sponges grow at the bottom of the sea in greater proportion or at least as plentifully as potatoes in a field is entirely erroneous. A further extension of the simile of field produce would enable us to say that the plentifulness of sponges on the bottom would more closely resemble mushrooms in a meadow. According to statistics in the American Bulletin between the years 1900 and 1904 inclusive, each man engaged in hooking produced an average of 100 lbs. Sheepswool sponges a year as compared with an average of 81 lbs. for the years 1905 to 1908 inclusive. The production per diving boat per month of actual operation is, of course, much greater, but it shows the same irregularity as is found in the hooker's production.

Hooking and harpooning are essentially the same and are limited by the same conditions. They can be carried on only when the weather is moderate and the water clear, and as the latter essential may occur on some beds only at intervals of several years, there is imposed in these methods of fishery certain natural close seasons which operate to protect certain beds by restraining the fishery for sufficient periods to allow of their recuperation. In most places, however, clear water is the rule, and in such cases hooking may be carried on for a greater or less part of each year. As a rule whenever the beds are sufficiently productive to make it profitable they are worked beyond reasonable limits until, more or less gradually, the yield becofnes unprofitable and most of the spongers withdraw to other fields. A curious factor assisting the recuperation of the beds reserved for hookers is the regenerative growth of the fragments remaining attached to the bottom after the sponge is torn away. It often happens that the hooks are inserted above the base, and more or less of the root is left to grow into a new sponge. On frequently worked beds the spongers often find apparently large sponges which are so flat that the hooks cannot be inserted into them at all. This is the result of the small morsel of sponge left by an earlier fisherman growing into a flat mass.

**Machine Diving.** The objections generally made against the use of the diving machine are principally two : viz.—

(1) That the divers, with their heavy leaden-soled boots, crush innumerable small sponges in walking over the bottom ; and

(2) That they take the large and the small sponges indiscriminately, leaving the bottom denuded of the growth essential for reproduction.

Anyone acquainted, either theoretically or practically, with the principles of diving will look upon this objection as ridiculous. It might seem to the onlooker that the diver on the deck of his vessel is burdened until he is hardly able to walk, partly by the essentials of his dress, but largely by weights, which he deliberately adds, for the express purpose of enabling him to keep on the bottom when submerged. After his entry into the water, when his dress becomes inflated it is necessary to release air from time to time, not only for the purpose of respiration, but to prevent the buoyancy of his inflated suit from raising him to the surface. It is one of the well-known restrictions of working in the diving dress that, whilst a strong upward pull can be exerted, a vigorous lateral push can be put forth only when the diver can place his foot or some part of his body against a fixed object, while even a slight downward push or blow cannot be delivered unless the operator can anchor himself by holding with his hand or by other means. These restrictions in the employment of his full strength all result from the lightness with which the diver rests on the bottom ; the ponderous and grotesque object which can barely stagger on the deck of the boat treading gently with but a few pounds pressure as he travels over the bottom. The weight of his tread consequently could seriously injure but very few of the smallest sponges, and as his footprints could not possibly cover more than a very small proportion of the ground on which he works, this objection to the diving machine may be safely discarded. The second objection, stated above, must be regarded more seriously. It has been stated that the diver is unable to distinguish accurately the sizes of the sponges owing to the darkness in which he works, while others, who advocate the use of the diving apparatus, claim

that he is in a much better position to do so than the hooker, who has to look through a deep stratum of water of variable transparency. It is obvious that the diver must have the advantage in this case as to the distinguishing between the smaller and the larger sizes of sponges, and he can thus therefore avoid any unintentional breach of the law. But so long as the undersized sponges have a market, and breaches of the law are not punished, it is quite possible that most of the young sponges that come their way will be gathered. The conclusion of the matter is, as regards these waters, that in view of the increasing exploitation by means of the diving apparatus, the grounds now reserved to the hookers will not have the same power of recuperation in the future as in the past, and that without some expenditure of effort in the fishery the product of these beds will tend to fall at an increasing rate. The consequence of this will be that the principal seat of the sponge fishery will gradually move into deeper and deeper water until the limit is reached, either by the depth in which it proves practicable to work, or by the attainment of the limits of sponge production, which may be fixed by either the depth of water or the absence of a suitable bottom.

The introduction of diving came at a time when the older method of sponging had finally demonstrated its inadequacy to supply the demand for sponges, and by developing new beds it has deferred the time when the Florida sponge beds will no longer be able to sustain the demands of the market. On the other hand, it will undoubtedly operate to retard the recuperation of beds already or about to become exhausted, and will of itself tend to depopulate the beds on which it is carried on, and indirectly the hooking grounds adjacent to such beds. What may be the ultimate result of the

introduction of the diving machine will depend largely upon the area and productiveness of the beds outside of the 8-fathom (48 ft.) curve. If they be four or five times as great as those of the beds within that limit, the "Bay" grounds can support a profitable fishery for some years to come; but if they are no greater than there is now reason to suppose, the effects of the fishery will soon become apparent.

**Dredging or Trawling.** The dredge or gangava is not used in Florida or the West Indies, but the testimony of European authorities and an appreciation of the effects of the dredge and beam trawl used by naturalists indicate that without regulation its effects must be disastrous. It has some justification if, when used in profound depths, it takes sponges wholly beyond the reach of other methods of fishing; but even then it would probably retard the recuperation of adjoining beds in shallower water. In the same manner as denudation by the scaphander would curtail the supply of young sponges in shallower beds.

With the gangava there cannot be even such imperfect selection as is exercised by the hooker and the diver, and it is therefore a destructive engine, the proportion of young sponges brought up being correspondingly greater. On the banks of Lampedusa, where the gangava and the scaphander work practically side by side, it is stated, on the authority of Lucifero, that the refuse sponges brought up by the former constitute 25 per cent of the total catch, while but 6 per cent of the divers' catch is composed of refuse, small and seconds. On the same authority it is stated that, owing to the damage done to small sponges, it requires five years for banks to recover from the effects of dredging, and even then the crop is limited, while but two years suffice for the recuperation of beds

exhausted by diving, and the crop then produced is comparatively abundant. While the hardships and personal risks of the dredgers are negligible as compared with those attending diving, the effects on the beds are far more disastrous.

**Measures Proposed.** The possible measures for the regulation and conservation of the sponge fisheries resolve themselves into—

(1) The prohibition of taking sponges below a given minimum size ;

(2) The establishment of close seasons ;

(3) The restriction of the character, amount and location of the apparatus employed ; and

(4) Sponge culture.

The taking of young sponges is one of the great abuses of all sponge fisheries, and that one most fatal to the perpetuation of the beds ; and young sponges are taken by all the present methods of fishing though in varying degrees. A few of them are thrown away by the fishermen, but the vast majority are placed on the market. The present minimum limit placed on sponges is 4 ins. in the longest diameter. If the law is to be made really effective for the protection of the beds, the minimum limit must be raised to 5 ins., and the law must be vigorously enforced against spongers

# CHAPTER XI

## THE SCAPHANDER

**The History of the Scaphander.** There has been a furious conflict of opinion in regard to diving by means of the scaphander or diving apparatus. It is difficult to put the two cases fairly enough to divest the one case or the other from some degree of prejudice.

The ancients perceived the great advantage of some method which would enable them to breathe under water and permit them the use of their hands and feet. The record of the art of diving having been practised for a purpose of utility is first mentioned in that part of Homer's *Iliad*, in which he compares the fall of Hector's charioteer to the action of a diver. Mr. R. H. Davis, Managing Director of Siebe, Gorman & Co., Ltd., has described, in his book on the subject of diving gear and diving methods and submarine appliances generally, all possible forms of diving dress or aids to diving, and in his chapter on "The Evolution of the Diving Dress," he states that the art of diving was known approximately eleven centuries before the Christian Era, Thucydides being the first to mention the employment of divers for mechanical work under water. He relates that divers were employed during the defence of Syracuse (215-212 B.C.) to saw down the barriers which had been constructed below the surface of the water with the object of obstructing and damaging any Grecian war vessels which might attempt to enter the harbour. At the Siege of Tyre (333 B.C.), too, divers were ordered by Alexander the Great to destroy or obstruct the submarine defences of the besieged city as they were erected. The object of these obstructions

was analogous to that of the submarine mine to-day. The employment of divers for the salvage of sunken property is first mentioned by Livy, who records that in very early days considerable treasure was recovered from the sea.

By a law of the Rhodians, their divers were allowed a proportion of the value recovered, varying with the risk incurred or the depth from which the treasure was salved. The most romantic case that is mentioned in the history of the diving dress is in connection with Anthony and Cleopatra. No doubt Anthony was in a somewhat frolicsome mood when the idea seized him that he would like to prove his skill as an angler before the object of his adoration. He sent down a diver secretly with a fish previously caught to attach it to his hook. The trick was speedily discovered by Cleopatra who, in the same spirit, dispatched another diver to fix a salted fish on the hook!

The earliest mention of any appliance for assisting divers, apart from the salvage of sunken property, occurs in the works of Aristotle, who speaks of a sort of vessel for enabling men to remain some time under water. It is also recorded that Alexander the Great made a descent into the sea in a machine called a "Colympha," which had the power of keeping a man dry and at the same time of admitting light. Pliny also speaks of divers engaged in the strategy of ancient warfare who drew air through a tube, one end of which they carried in their mouths, whilst the other end was made to float on the surface of the water. Roger Bacon (A.D. 1240) is supposed to have invented a contrivance for enabling men to work under water, and in Vegetius's *De Re Militari* (editions of 1511 and 1532—the latter in the British Museum), is an engraving representing a diver wearing a tight-fitting helmet to

which is attached a long leathern pipe leading to the surface, where its open end is kept afloat by means of a bladder (*see* illustration). This method of obtaining air during subaqueous operations was probably suggested by the action of an elephant when swimming; the pachyderm instinctively elevates his trunk so that the end of it is above the surface of the water, and thus he is enabled to take in fresh air at every inspiration. Other forms of diving apparatus have been invented by the following—

Lorini—an Italian—about the year 1609.

Borelli—who published the description of his apparatus in his work *De Motu Animalium*, Rome, 1682. His invention is worthy of special note, inasmuch as the apparatus depicted therein aims at the renewal of the air and the separation of the exhaled from the inspiratory air.

Kleingert—of Breslau—in 1708 invented the next contrivance worthy of mention, and the one most nearly resembling the modern diving dress.

John Lethbridge—a Devonshire man in the year 1715 contrived " a water-tight case for enclosing the person."

**Siebe's " Open " Dress.** We come now to the most important of all the inventions relating to diving apparatus. Up to the year 1819 only crude and ineffective apparatus had been used. In that year, however, Augustus Siebe (founder of the firm of Siebe, Gorman & Co., Ltd., contractors to the Admiralty) produced his " open " dress, worked in conjunction with an air-force pump. This dress consisted of a metal helmet and shoulder plate attached to a water-tight jacket, under which, and fitting closely to the body, were worn trousers, or rather a combination suit reaching to the armpits. The helmet was fitted with an air-inlet valve, to which one end of a flexible tube was attached, the

other end being connected at the surface with a pump which supplied the diver with a constant stream of fresh air. The air, which kept the water well down, forced its way between the jacket and the undergarment, and escaped to the surface on exactly the same principle as that of the diving bell, hence the term " open " as applied to this dress.

This dress enabled much excellent and varied work to be accomplished—work which could not have been attempted before its introduction. It was far from being perfect nevertheless. The diver in it was compelled to maintain a practically upright position while under water. More serious still, if he stumbled and fell, the water filled his dress and, unless quickly brought to the surface, he was in danger of being drowned.

In endeavouring to overcome this and other defects, Siebe carried out a great number of experiments extending over several years, resulting in the introduction, in the year 1837, of his " close " dress, in combination with a helmet fitted with air-inlet and outlet regulating valves. This type of apparatus was used in the later stage of the *Royal George* operations, taking the place of the " open " dress which had been in use from their commencement.

To Siebe, therefore, must be given the great distinction and honour of having introduced a principle which is in universal use to this day. Great improvements, however, have been introduced in the apparatus, and the value of the submarine work which it has been instrumental in accomplishing is incalculable. Some idea of the importance of Siebe's invention may be gathered from the fact that his principle is universally used to-day in harbour, dock, pier and breakwater construction, in the sponge and pearl fisheries, in recovering sunken ships, cargo and treasure, and that

*By kind permission of* *Siebe, Gorman & Co., Limited*

DIVER IN DIVING DRESS

As supplied to the Admiralty, and as used by sponge divers, though without the telephone

every ship in the British Navy, as in most foreign navies, carries one or more sets of diving apparatus for use in case of emergency—repairing damage, clearing foul propellers and valves, cleaning and repairing ships' hulls below the water-line, and for recovering lost anchor, chains and torpedoes.

The diving apparatus of the present day represents so great an improvement on the first types of Siebe's apparatus, embodying as it does a great number of new features—or improvements on old features—that it might be taken for an altogether new invention. We may take as an example of the perfect apparatus that in which the British Admiralty pattern diving helmet (Davis's patent) plays so important a part.

In this, the segmental rims, by means of which the helmet is removed from the corselet by one-eighth of a turn, are clearly shown, as is also the arrangement of the telephone instrument, valves, etc.

The addition of the telephone is of great value where all intricate work has to be performed.

## CHAPTER XII

### THE SCAPHANDER—ITS USE

It has been clearly shown in describing the modes of fishing and the results thereof, in the previous chapters of this book, how very largely the scaphander or diving apparatus enters into the business of sponge fishing. It certainly enables the fishers to obtain the best kinds of sponges in the largest quantities possible. It would be difficult, if not impossible, to go back now to the old processes of naked diving, trawling, and harpooning, and leave out the scaphander. The sponge trade would be greatly if not fatally injured, and the public all the world over would be deprived of one of the greatest aids to health and cleanliness; as for the domestic uses of this article, including its matchless value for washing down horses, carriages, motor cars, etc., and thousands of other uses in the arts and manufactures, and in daily life, no substitute could be found. For the rapidity and the value of the results obtained thereby the scaphander has no equal—in fact, the other processes by which sponges are obtained in quantities are far more costly in proportion to results. Without its use, the more or less barren islands of the Mediterranean Archipelagos would be unable to sustain a quarter of the number of their inhabitants.

It is strange, therefore, to find a fairly active movement in existence which has for object the abolition of the scaphander. Probably the first to start this movement was Ch. Flégel, member of the Austrian Fishery Society, Vienna. He has endeavoured, by dint of persistent exertions, to obtain the support of various

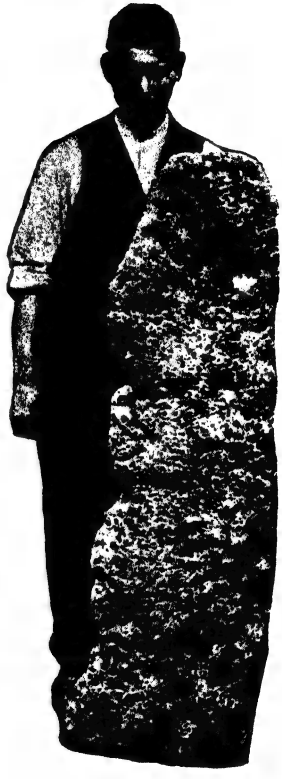
governments owning or protecting the sponge fisheries of the Mediterranean. He has employed all kinds of methods to accomplish his aim. In the paper that he caused to be presented before the Fourth International Fishery Congress, held at Washington in 1908, he catalogued a startling number of accusations against the scaphander. Scarcely anything was too bad to say against it. He began by drawing a sweet picture of the sponge fishermen who lived everywhere in health and happiness "so long as they gathered sponges by means of the three methods hygienic and consistent with the public welfare—that is to say, by means of naked diving and by fishing with a hook or harpoon and the trawl."

Ch. Flégel brings in evidence every regulation or law that has been issued by any government or controlling power that may be in favour of his argument. He even goes so far as to quote an authority in favour of the scaphander, in order to pulverize him afterwards. He says: "Giglioli, a scientist of great ability, unfortunately favoured the diving apparatus in this practical question, having not the least perception of the miseries it brought about. The evils of the method were thus not appreciated by the Naval Ministry and the Ministries of Agriculture, Industry and Commerce, and the use of the diving apparatus was recommended to the Italian sponge fishermen often and warmly in the *Condizioni* until 1901." There is no reason given by Flégel for stating that this scientist "of great ability" had not "the least perception of the miseries it brought about." It is only natural to suppose that a man of such eminent ability as Giglioli would, in the usual course of things, inquire into the effects of the use of the scaphander before recommending it so warmly.

After admitting that statistics relating to sponge fishing are completely lacking, Flégel has the audacity to proceed to give figures as to numbers of divers and sailors employed all over the world, and ventures to assert (notwithstanding the lack of complete and general statistics on sponge fishing) that the yearly mortality of sponge fishermen in the diving apparatus is about 20 per cent. Careful inquiry at the principal fisheries has resulted in proving that this figure is very largely in excess of the true percentage.

How Flégel collects his facts is difficult to imagine, but if the results of his inquiries are usually as inaccurate as the fact cited by him—" that a sponge needs four to five years to reach maturity, after which it begins to die, having discharged its fluid with the germs," his statements cannot be believed. Now a medium toilet sponge takes usually about four years to grow. Larger sponges, such as are used in the bath, would take eight to ten years to grow, and larger ones still, which for the most part are cut up into pieces of convenient size, would take a great number of years to develop. International Sponge Importers, Ltd., of which company the writer is a director, has specimens, of which the following are details: Mediterranean Honeycomb, round shape, circumference 9 ft. 6 ins., height 1 ft. Another of long shape is 4 ft. 6 ins. long and 1 ft. 6 ins. wide. Velvet sponge from Honduras—circumference 5 ft. 6 ins., height 2 ft. Florida Cup—circumference 4 ft., height 1 ft. 6 ins. There are many others of equal if not greater size that have been examined by him. Most of these sponges show no sign whatever of decay, and therefore it is evident that Flégel is absolutely wrong in stating that after the five years the sponge requires to reach maturity it begins to die.

In a subsequent chapter allusion is made to Flégel's inaccuracy in minimizing the dangers encountered from sharks. One of the most extraordinary stories of such an attack is told by Mr. Solon Pelecanos in an article entitled "Sponges and Sponge Fisheries," from which he has kindly given me permission to quote.



MEDITERRANEAN HONEY COMB
Width 1 ft. 6 ins.,
Height 4t f. 6 ins.

"It happened that a diver named Latari, from the Island of Calymnos, on a certain day, although he could not see clearly through the water, took the stone and plunged. The man who held the rope in the boat perceived that the rope was not drawn by the diver, and on looking into the water, to his horror saw a huge shark which had swallowed the diver. Fortunately for the latter the large flat stone which he held in his hands proved perhaps too much for the shark, and he immediately vomited his victim, who was instantly drawn up to the boat by the rope holder alive. He had received severe wounds on both sides of his body from the teeth of the shark. He was removed at once to a hospital

at a neighbouring port for a month, and then was sent to his native island where his convalescence lasted three months. This may seem an incredible story, but it is a true one. The man still lives in the Island of Calymnos and still follows his dangerous profession. One of the two doctors who attended him was Dr. A. Pelecanos, since dead, who was the father of the narrator of this incident."

Regarding the damage caused to the fishery, Flégel says "that the heavy apparatus breaks and crunches the embryo sponges that lie in the path of the diver, and he searches over the entire sponge-bearing area. He takes, moreover, not only the largest and best sponges but also the small ones, arguing that what he does not take to-day will be taken by someone else to-morrow." He ought to know that care is taken as far as possible that the spot to be visited the next day by the same or other divers is carefully noted, as it obviously would not be a profitable task for the second diver to go over the same ground as did the diver of the previous day. Moreover, the idea of breaking and crunching the embryo sponges is ridiculous. The heavy boots used by the diver cannot be considered as being much worse than the passing over of the naked diver, as, of course, what appears to be heavy on the surface is light at the bottom of the sea. Then, as the diver in the scaphander can go over such a large area, he naturally would not waste any time in collecting the small sponges, whereas the naked diver, in view of his only having a few moments in which to work, gathers rapidly all that is around him, whether large or small.

## CHAPTER XIII

### THE ABUSE OF THE SCAPHANDER

THE change from the supposed idyllic existence of the islanders who form the majority of the sponge fishermen of the Mediterranean was brought about by the introduction, in 1866, of the scaphander in Greece and Turkey. The great and increasing extent of the use of the scaphander during the ensuing fifty-five years is not denied nor explained by this agitator, Ch. Flégel, posing as a philanthropist. Neither does he explain the fact that nearly all, if not quite all, the countries or local authorities who withdrew at some time their permits for the use of the scaphander have since granted them again. Is it likely that the fishers themselves would continue to use the scaphander if it were the deadly thing that he imagined it to be? For two generations it has not been discarded, but, on the contrary, increasingly used by those who have practical knowledge of it in the work done in the sponge fishing season. In his efforts to build up his case, Flégel flings a wanton insult at these brave and hard-working fishers. He states that "their motive lies in inordinate greed of gain. Filled with this greed, which stops at nothing, men found it good to adopt for the fishing of sponges the diving apparatus invented for quite other purposes." It is untrue and scandalous to say that these men are "filled with greed." All those who have authority to speak will assert that the sponge divers have the same desire to earn their living and provide for a "rainy day" as other men. This is not inordinate greed—far from it. As it is, they are poorly remunerated

considering the early training they require and the hard and hazardous work they do, always taking risks that other men, or rather untrained men, would flinch from. There is not the slightest trace of " inordinate greed " in these men. It is a wicked aspersion to impute it to them. As to the diving apparatus being invented for another purpose, this is quite fallacious. The object of the numerous inventors who have contributed their ingenious ideas to produce the perfected modern diving apparatus was not confined to going down to the sea-bottom for any particular purpose, but for all purposes. Besides, it is quite misleading to say that the diving apparatus was used for sponge fishing while it was invented for different purposes, for one of its most important uses after sponge fishing is in diving for pearls.

Flégel goes on to say that " the only danger threatening the naked diver is the attack of the shark, but he does not consider this eventuality, as it is a very rare one." This statement is a gross exaggeration, for, unfortunately, many accidents occur to these venturesome and brave men, as is inevitable when the deep plunges they take to descend to the rocky and uneven sea-bottom are considered. Danger is very near to them whenever they are at work. To lightly pass over such risks in order to bring into greater relief the supposed and also the real dangers of the diving apparatus is not a fair statement of the case. Against this we have the reliable statement of Mr. R. H. Davis, Managing Director of the very important company, Siebe, Gorman & Co., Ltd., who states—

" Considering the conditions under which the diver works accidents are surprisingly few, and it is the proud boast of Siebe, Gorman & Co., Ltd., that notwithstanding the fact that there are several thousands

of divers using their apparatus in various parts of the world, not a single accident attributable in the slightest degree to faulty construction or defective materials has ever occurred. Such accidents as have happened have been due to causes beyond control and quite unconnected with the diving appliances. Take, for instance, the case of a diver engaged in a salvage operation on the Chilian coast some years ago, who was killed through a heavy box of silver which he had worked hard to recover, falling out of its sling and crushing him. This was hard luck indeed. Then there was the case of the diver Pearce, who some years ago was engaged in salving bales of cotton from the s.s. *London*. A chain, having at one end of it four sharp-pointed hooks, was let down to the diver whose duty it was to fix the hooks into the bales which were hauled to the surface. One morning Pearce, having fixed the hooks in one of the bales, signalled to those above to try whether the strain would hold. Whilst feeling to ascertain if the bale had started, the hooks, not being sufficiently secure to stand the strain, gave way and, tearing out of their grip through the packing, one of them caught Pearce in the palm of the hand and dragged him from the bottom of the hold to the upper deck. When brought to the surface he was in a state of collapse. In three months, however, he was at work again.

"The most dangerous foe the diver ever meets with is the octopus. Once this creature, if of any great size, gets its tentacles with its countless suckers fastened to the diver, it is only by almost superhuman effort that he is able to free himself from its grasp. There are cases on record where the struggle has only terminated when both diver and his adversary have been hauled bodily to the surface and on to the deck of the diving vessel, and even then the octopus has fought furiously.

"Sharks, as a rule, do not interfere with the diver, but the late A. Lambert had an adventure with one in the Indian Ocean, which deserves mention. The diver, whilst engaged in fixing copper sheets to a coal hulk off Diego Garcia, was annoyed by the attentions which the same shark paid him several days in succession. Each day it ventured a little nearer, but Lambert, by opening the air escape valve of his helmet, was able to scare the monster away. After this sort of thing had been going on for nearly a week, however, he determined to end the annoyance. Signalling to his attendant for a large knife and a rope with a noose, which was promptly lowered to him, Lambert held out his bare hand as a bait to the shark, and as it began to turn on its back for the attack he stabbed it repeatedly, passed the noose round its body and had it hauled to the surface."

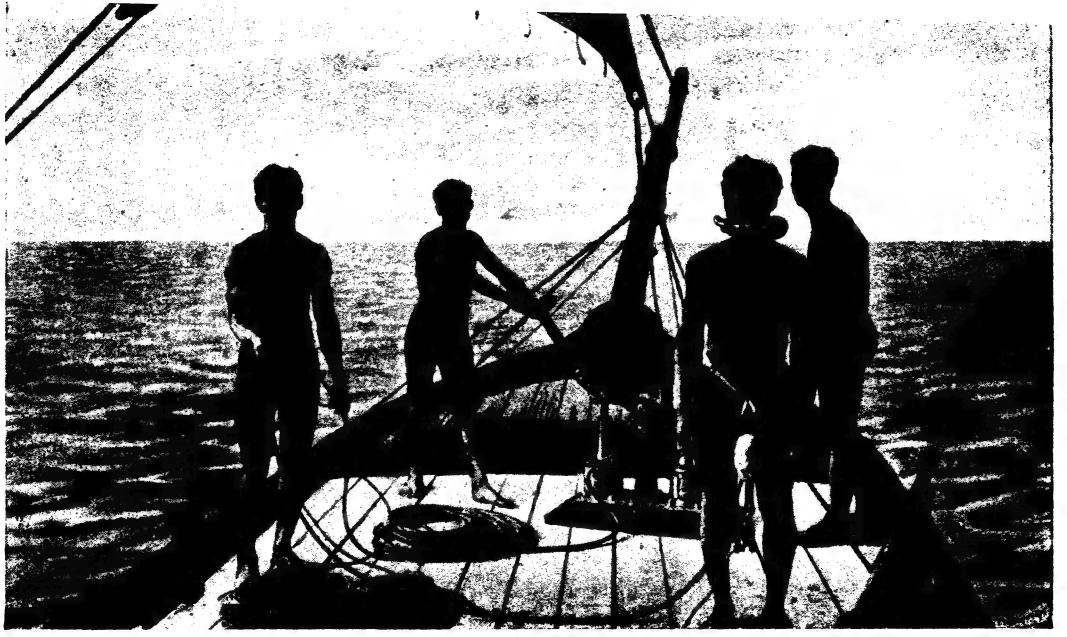
Thus it is clear that if accidents occur to the men in diving apparatus they have been caused through inattention to the directions issued with each apparatus or through pure carelessness. Flégel in more than one passage states that there is a lack of official or private statistics on the mortality and diseases of divers using the diving apparatus and on the harm done by the apparatus to the sponges in respect to their reproduction. Thus, being unable to produce proofs in support of his contentions, he throws out wild exaggerations and fantastic statements far removed from a calm and exact survey of the facts relating to the cause he advocates.

## CHAPTER XIV

### THE LATEST INVENTION

**The " Fernez " Diving Apparatus.** A recent invention has been introduced to the sponge fisheries under the name of L'Appareil Respiratoire " Fernez." This apparatus combines the benefits of naked diving, as previously described in these pages, with the best features of the ordinary diving apparatus. It is being manufactured and supplied by Maurice Fernez, 40-42 Rue de Vitry and 1-3 Rue d'Alsace-Lorraine, Alfortville (near Paris). A company was formed in 1912 to exploit the patents of Maurice Fernez for a new apparatus for naked diving. Many public trials attended by experts and the two delegates of the Dodecanesus and Denizli have been made. Both these delegates represented their country at the Paris Peace Conference. It was then found that the advantages claimed by the inventor were justified. The depth at which this apparatus can be safely operated is 30 metres. The simplicity of the " Fernez " apparatus is made apparent by studying illustrations Nos. 3 and 4, from which it can be seen that the complete outfit can be adjusted to the diver's body within the space of a few seconds.

Illustration No. 2 shows each different section necessary to the diver's breathing when under water. Assuming that a diver intends to prepare for a plunge, he will commence to adjust the apparatus by strapping the belt round his waist. Suspended from the belt will be seen the air-pocket *A*, connected to which is a long rubber tube extending to a double-handled pump. The flexible tubing *B* reaches up the diver's back and

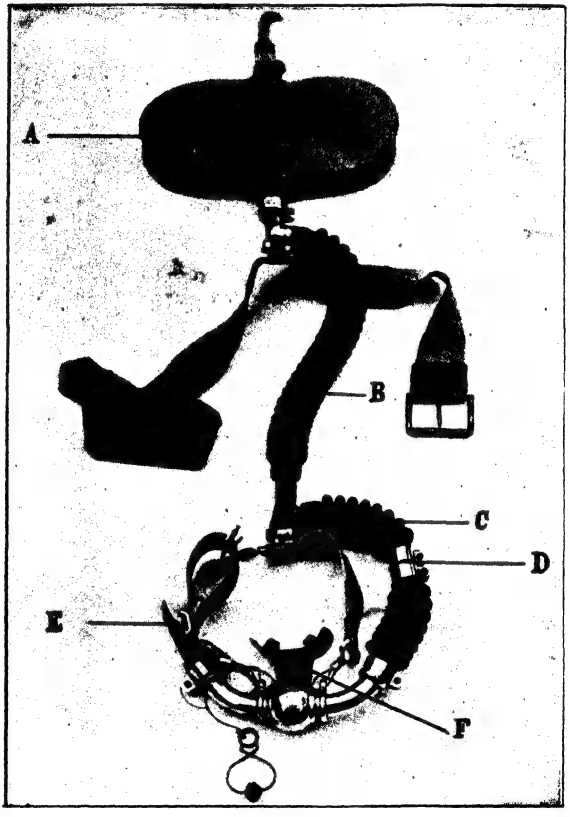


SPONGE DIVER EQUIPPED WITH THE FERNEZ APPARATUS COMPLETE WITH PUMP
No. 3 (*see* text)

connects to tubing *C*. This part and the remaining parts are strapped round the diver's neck after his having clenched the mouthpiece *F* firmly between the teeth and lips. At the section marked *D* is an inhaling valve, through which the diver draws sufficient air for his breathing from the air-pocket. Part *F* represents the exhaling valve, out of which is emitted all the foul air from the lungs and also any surplus air which the air-pocket cannot hold. The question of the diver receiving too much air on account of over-pumping is thus solved. The air-pocket will only hold a quantity of air equal to the pressure of the water. The adjustment is completed by the diver placing nose-clips on his nose, as seen in illustration No. 6. Should the water be considered injurious to the eyes in any way he is at liberty to fix a mask over his face, as in illustration No. 5.

FERNEZ DIVING APPARATUS
No. 4 (*see* text)

The pump having been made to work, the diver may descend to the sea-bottom head first by pulling himself down a rope which has previously been weighted and thrown overboard, one end being fastened to the side




FERNEZ DIVING APPARATUS

No. 2 (*see* text)

of the boat. Or, better still, he can descend the same rope feet foremost by letting the rope slide between his legs. To remain on the bottom any considerable time the diver wears a lead weight, as seen in illustration No. 3, which he can discard when desirous of ascending to the surface.

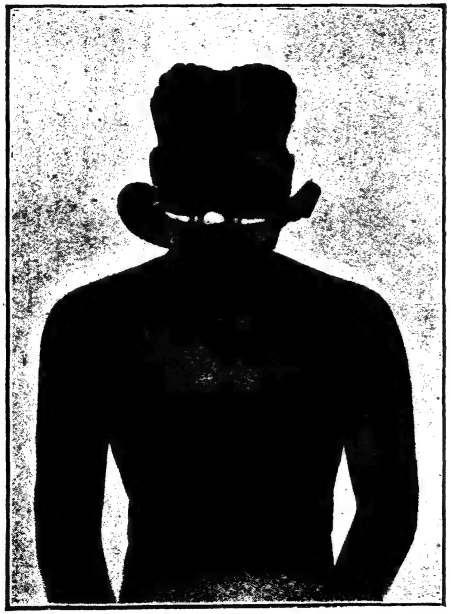
The tubing is composed of three thicknesses, constructed in such manner as to resist the various pressures of the water. The thinnest part is connected with the mask. It is calculated so that the pressure of the water practically equals the pressure of air inside the tubing. In this way the progress of the diver along the bottom is not impeded by a heavy weight of tubing as in the case of the diver with ordinary apparatus, the tubing of which has to be much thicker. It costs much less than any other apparatus, and the diver is not restricted in his movements at all.

Experiments have been carried out to depths of 20 to 25 fathoms, divers remaining at these depths from 5 to 10 mins. and regaining the surface in good condition.

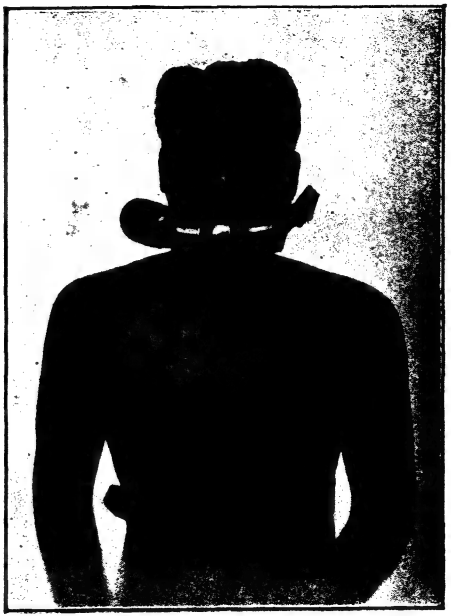
These depths, it must be remarked, are claimed by the makers as having been attained; but the great drawback of this patent is that the diver, being naked, soon feels the cold of the deep water and cannot work for more than a few minutes. This places the apparatus at a great disadvantage as compared with Siebe, Gorman & Co.'s.

The engineer specialist of Symi, who previously made another kind of dress for Denairouze, states as follows—

The naked diver is subject to several disadvantages. In the first place he remains under water without breathing for 3 or 4 mins. A man breathes 15 to 16 times per minute, therefore the naked diver loses an average of 45 to 48 breaths, to the detriment of his



FERNEZ DIVING APPARATUS
No. 5 (*see* text)



FERNEZ DIVING APPARATUS
No. 6 (*see* text)

health. He cannot eat during the day, which is also to the detriment of his health. But, with the " Fernez " apparatus, the diver is not subjected to these dangers. On the contrary, he can remain under water for a much longer time without running any risk at all to his health.

*Extract from the journal " Il Messaggero di Rodi "*

THE NEW FISHING APPARATUS FOR FISHING SPONGES

" On the 2nd October, 1920, various experiments were made with the new apparatus in the Baia di Cava. This apparatus has been invented by Monsieur Fernez, of Alfortville (France), and brought to Rhodes by Giorgio Georgas, who personally directed the experiments made before the chief officials of the island.

" The three experiments which were made in calm sea at a depth of 20 to 26 metres gave good results, and the physiological condition of the three divers who dived in succession was proved by Dr. Maggiore Battastini and Capt. Bini, who found no signs of injury to the divers.

" The apparatus therefore answers the purpose for which it was intended, viz., for use in fishing sponges in place of the scaphander."

## CHAPTER XV

### REGULATION OF SPONGE FISHERIES

THE regulation of the sponge fisheries in the Mediterranean has been, with few exceptions, chiefly concerned with the production of a revenue for the particular Government in whose waters they were situated. Recently there have been introduced measures for the protection of the spongers themselves from the physical effects of their calling.

In addition, measures are in force in a few places which tend to protect and conserve the sponge beds. In Dalmatia attempts to introduce the scaphander and the dredge have met with opposition and interdiction, and the sponge beds are open to other spongers only during alternating periods of two years. In Cyprus the dredge is entirely prohibited, and in Egypt its use is authorized only in depths greater than 262 ft., where it is impossible to take sponges by any other means. In Greece, Tripoli, Tunis, and on the banks of Lampedusa, all forms of apparatus are permitted under varying conditions as to taxes and licences; but in Turkey, Egypt, Crete and the principality of Samos the scaphander is prohibited on broad economic and humanitarian grounds, rather than for the narrower consideration of the protection of the sponge beds, and for the same reason Greece has attempted to regulate the maximum depth to which this apparatus may be used without restricting in any way its employment in shallower waters in which it might be supposed to do greater damage to the beds. The attitude of the

Greeks in this matter is readily understood, for they are dominant in the fishery and most of their diving is carried on in waters away from home.

In Florida, the Bahamas and Cuba, while the matter of revenue has been by no means overlooked, more consideration has been given to questions of conservation of the fisheries (the measures adopted being the prohibition of the use of supposedly destructive forms of apparatus), the establishment of close seasons, and a minimum size of sponges which it is permissible to take.

Most of the buyers and vessel owners at least would welcome more rigorous measures, which would entail no hardship to anybody if enforced on all without prejudice or favour. The difficulty now is that each man feels that the law will be broken with impunity by some of his competitors, and that he may as well get his share of such profits as may accrue from disregard of the regulation.

These three general means of regulating and conserving the sponge fishery above discussed are applicable to the public beds limiting the intensity of the fishery, aiming to secure and maintain what we have rather than hoping to add to it. They are restrictive and conservative rather than constructive, and without the discovery of new ground offer little hopes of maintaining the supply in equilibrium with the constantly growing demand.

To sum up : to secure a future generation, the conservation of the natural sponge beds for the maintenance of the fisheries already established ; to regulate those which may be introduced in the future, and to provide for an increase in the sponge supply to meet the growing demands of civilization, taking Florida, for an instance, changes must be made in the Federal and State statutes

to meet the following requirements in addition or in amendment to those already provided for—

(1) The minimum size of sponges allowed to be taken, landed, or sold should be increased from 4 to 5 ins. in their maximum diameter. This would prevent the destruction of sponges commercially of low value, would conserve the beds, and, after as little as one year even, would increase the income of the fishermen with out materially decreasing it in the meantime.

(2) In addition to the restrictions now in force the use of the scaphander should be prohibited in water deeper than 20 fathoms. This suggestion may sound strange to those who have been associated with the divers in diving dress, but it is intended primarily as a hygienic measure to protect the divers from the evil results attending work in deep water, and at the same time to protect the workable beds by maintaining outside of them a possible reserve of minute sponges to supply sponges gradually evolving into useful sizes.

(3) Gangavas, dredges and trawls should be prohibited in depths of less than 30 fathoms. This regulation, while not required by any present development of the fishery in Florida, will prevent any sudden unregulated development or method which would be undoubtedly destructive to the inshore grounds.

(4) State and Federal laws should be enacted for encouraging sponge culture in both territorial and extraterritorial waters, securing to private individuals or corporation the sole use under proper restrictions of suitable areas of the bottom for the purpose of raising sponges by artificial means. In case of further depletion of the natural beds, or with the growth of demand and the failure to discover new or more productive grounds, sponge culture offers the only possible means of prevention of a practical sponge famine.

## CHAPTER XVI

### ARTIFICIAL CULTURE OF SPONGES

As has been pointed out before in this book, by far the most costly sponges in the market are those from the Mediterranean, the Sheepswool sponges of the Bahamas and Florida being regarded as the next in quality. Of the latter the Florida sponges are superior to those sent from the Bahamas, as they possess a somewhat finer texture and a more regular and compact growth.

**Sponge Culture Experiments.** It was stated in 1785 by Filippo Cavolini in his account of experiments carried out in the Bay of Naples, that detached sponges were capable of fixing themselves and continuing their growth. It was not, however, until 1862 that attention was drawn by Oscar Schmidt to the fact that portions of a sponge would also fix themselves and grow, and the possibility of this application to the production of sponges on a commercial scale was pointed out. In consequence of the opinion expressed by Schmidt that, "if a perfectly fresh sponge is cut in suitable pieces, and if these pieces, properly protected, are again placed in the sea they will grow and finally develop into complete sponges," a number of experiments were made during the period 1863 to 1872 at a station established on the north-eastern point of the Island of Lesina. The experiments seem to show that when European sponges are treated, the cuttings can be reared successfully, if carefully handled, until they become of marketable size. From the account given it appears that for making sponge cuttings the most favourable time is

during the winter months, as in cool weather there is less tendency for the sponges to suffer from detachment and exposure to air. The best localities are sheltered bays with pure sea water as free as possible from mud. The sponges from which the cuttings are to be made require very careful treatment, and the method finally adopted by Buccich was as follows : The sponges having been obtained either with tongs or a drag net, and the injured portion as far as possible removed, they are fixed by means of wooden pegs to the inner side of a sort of fish box which is towed behind the boat. It is better, especially in warm weather, to leave the sponges for a little time in this box in order to see whether or not putrefaction is likely to take place. The cutting is done upon a small board moistened with sea water with a saw-edge knife, and the pieces are cut so as to measure about 1 in. each way. Each piece should have as large an area as possible intact. Various methods of planting the cuttings have been tried. The pieces, especially those with only one cut surface, very soon attach themselves to a suitable base if brought into close contact with it. They must, however, in general be fastened in some way to prevent them from being moved about by waves and currents. Great ingenuity has been shown in trying various kinds of attachments. The efforts so made have met with many failures, but the final method adopted by Buccich enabled 90 per cent of the cuttings to be developed successfully, and it was found that the cuttings grew two or three times their original size during the first year. Buccich was of opinion that although some pieces will grow to a considerable size in five years, it would require seven years to raise completely matured sponges fit for the market.

**Experiments in Florida.** Rathbun was the first to

give a description of the trials made at Key West by the agent of Messrs. McKesson & Robbins, the great wholesale druggists of New York, who have contributed specimens to the United States National Museum. The author remembers well this firm's exhibit at the Colonial Exhibition held at the Imperial Institute in London, which consisted of specimens of the Sheepswool in large glass specimen jars filled with spirit. The sponges showed no signs of cutting, and there was nothing in their appearance to indicate that they were the result of artificial cultivation. The agent of Messrs. McKesson & Robbins told the author that the localities in which these sponges were planted were not the most favourable for sponge development, and their growth was therefore slower than would otherwise have been the case. They were fastened to the bottom in a depth of about 2½ ft. of water by means of wires running through them. A period of about six months elapsed before their removal. Fully four months had passed before they recovered from the injury done them in the cutting, which removes the outer skin along the edges of the section. The original height of each of the cuttings is about 2½ ins. One was planted in a cove or bight where there was little or no sun, and its increase in size was very slight. The other specimens were placed in tide-ways and have grown to from four to six times their former bulk.

The following is a memorandum by Mr. James E. Benedict, of the Department of Marine Invertebrates, in the United States National Museum—

"Whilst in Florida several years ago, I inquired particularly into sponge culture. Many people deny that the experiments have ever been successfully tried, showing that it had not been tried to any great extent. I was informed, however, that by raising a sponge

nearly to the surface without lifting it out of the water, dividing it up and fastening the pieces to some anchor, and placing them in favourable localities, they grew rapidly. The sponge fishermen, however, are much opposed to experimenting in this direction as they believe it can only be successfully carried on when the grounds are parcelled out, which they think would result in monopoly and cutting off their means of subsistence."

**Would Sponge Culture by Cuttings be Profitable?** To what extent the culture of sponges, after the manner suggested by Schmidt, would be a profitable undertaking, depends largely upon the rate of growth of the cuttings as compared with the rate of growth of uncut sponges. As Dr. Von Marenzeller points out, it is questionable whether it is profitable to cut pieces of sponges which, uncut, would have more quickly reached the same size and weight than all the cuttings put together in seven years. In such circumstances, sponge culture had better be confined to the transformation of flat and therefore worthless sponges into round ones, which, though small, would find a ready market.

In the Journal of the Marine Biological Association of the United Kingdom, Mr. George Bidder, a member of the Association, who has been engaged for some years in studying the anatomy and physiology of sponges and who is a recognized authority on these subjects, has arrived at several conclusions of interest as to various methods for endeavouring to improve sponge fisheries. In addition to the practical proposals made by Mr. Bidder as to the most suitable lines upon which experiments might be carried on, it may be suggested also that in case these have already been tried, an attempt should be made to obtain sponges in the Bahamas from deeper waters, either by use of

the dredge or by the aid of divers. In the Mediterranean, sponges found in shallow waters, such as those from which they are obtained in America, are stated to be much coarser and less valuable than those taken from depths of from 15 to 20 fathoms. According to Professor Hyatt, sponges probably occur in American seas down to a depth of about 30 fathoms, and it is quite possible that an attempt to obtain some of those living at greater depths than 3 to 6 fathoms (to which the fishing is at present confined) might yield more valuable material. Mr. Bidder in considering the experiments of Buccich on propagation of sponges by cutting says two main questions present themselves—

(1) If the sponge be divided into many fragments, will the total increase of such fragments and their progeny be greater than the increase of the intact sponge and its progeny would have been in the same time ; the conditions of water, etc., being identical ?

(2) Are sponges, grown as recommended by Buccich, more or less favourably situated than those on the sea bottom ?

The answer to the first question in a carefully considered judgment would be in the negative. Obviously there is very little reliable evidence as to the rate of growth of sponges under natural conditions. In all the literature of the subject very little light is thrown on the probable ages of sponges of given size, their probable future rate of increase, or the dimensions at which increase stops. The fishermen of Nassau say that the young sponge reaches marketable size three months after its attachment. This opinion must surely refer to the quick-growing sponges, such as Grass, Fine Reef, etc., as the more valuable Velvet and Sheepswool sponges with their strong, yet soft, textures take much longer to develop Schmidt inclined to the opinion

that the growth of the self-sown sponge was no faster than that of one of his cuttings which were found to take seven years to reach marketable size.

When Buccich records that his cuttings grew to two or three times their size in the first year, we have no reason for supposing that an equal increase would not have taken place had they remained intact in the surface of the parent sponge. It is conceivable, indeed, that a greater increase would have taken place, for it will be remembered that the life of a sponge depends on a most interesting system of hydraulic canals, on the mechanical perfection of which depends the quantity of its food. Each cutting only contains the fragment of such a system broken into, with direction of currents confused or inverted, and pressure chambers open. Until growth has repaired the injuries the cut fragment must necessarily be at a disadvantage as compared with a complete sponge of its own size. It would appear also that the complete small individual is at a disadvantage as compared with the equal portion of a large and powerful sponge. There is no positive evidence of any causes which check the growth of a sponge, but it may safely be assumed that they are subject to senile decay. There is no evidence that the tissues of a senile sponge undergo rejuvenescence when they are divided into fragments. Buccich says that certain cuttings never grew at all or the growth was unequal, indicating slightly the more probable hypothesis that the fragment of an effete sponge is itself effete. It should be pointed out that misshapen sponges may thus be utilized. But it must be remembered that misshapen sponges can still breed, and that there is no evidence as to how far the reproductive function is interfered with by the cutting process. Mr. George Bidder considers that such interference is important.

Buccich found 90 per cent of his cuttings attained marketable size in seven years. Whether this is advantageous depends on the length of time taken by a self-sown sponge to attain marketable size. If this be seven years also, then the method is profitable for misformed sponges ; if it be only one year, then the quantity produced by natural production would be greater than by the method of cuttings. In view of the commercial importance of this question, it is highly desirable that observations should be made as to the rate of self-sown sponges. Professor Hyatt says that " the sponges near Nassau lie always in currents, sometimes running 3 or 4 miles an hour. Most of these conditions are essential for sponge growth, namely, a continuous renewal of aerated water, and a plentiful supply of food." In support of this opinion may be cited the opinion of Rathbun, who says of cuttings in Florida : " One was placed in a cave or bight where there was little or no current, and its increase in size was very slight. The other specimens were placed in tide-ways and have grown from four to six times their former bulk."

Mr. Bidder considers that great advantage might be obtained by inducing sponges to grow on hurdles rising some feet above the sea-bottom and allowing a distance between the centres of 4 ins. for cuttings and 12 ins. or more for grown sponges with a distance between every two hurdles equal to their own height. An ingenious proposition was offered by Dr. Marenzeller, which deserves attention. Larger sponges are naturally of greater value in proportion to their weight than the smaller sponges, and he points out that if two or three be attached closely together they will grow into one sponge. He further states that misshapen specimens could be utilized.

## CHAPTER XVII

### SPONGE TRANSPLANTATION AND CULTURE

MANY suggestions have been made that good European sponges should be transplanted alive to the Bahamas. This is the reverse of the natural process, the theory of which was formed by Professor Hyatt and mentioned in the first part of this book. Fine specimens might be carried in a suitably constructed tank on board a ship. This mode of transporting them would be the very reverse of that mentioned previously, as in the very early ages they were transported over the waters of the Atlantic into the Mediterranean on pieces of timber, sea-weed and other floating matter. Professor Hyatt is undoubtedly right in his theory as to the improving on type shown by the Mediterranean sponge in comparison with the West Indian and Florida sponges, which were their progenitors. He further says that the difference in quality between American and European sponges is due to the higher temperature of the American waters and to the coral sands. The density with which sponges can be planted on the bottom in any given locality is a subject which will require actual experiment on a commercial scale for its elucidation. That the ordinary waters will support a dense growth of miscellaneous sponges is well known, and among the Florida Keys Mr. H. F. Moore has observed an average of several to a square yard over considerable areas.

Though nothing is known of the actual facts concerning the food of sponges, it can hardly be doubted that all horny sponges, such as the commercial sponges are, feed on essentially similar material. If this be

MEDITERRANEAN WEST INDIES

On the left, a very good specimen of Fine Turkey Sponge on solid rock. On the right, a West Indian Yellow Sponge, on coral formation

true, it is fair to assume that an area which will support a large number of useless horny sponges should support and produce an equal volume of the commercial kinds. Dr. H. M. Smith states that in very shallow waters in the Philippine Islands he has seen commercial sponges somewhat similar to the Florida Grass sponge averaging one to every square foot of the bottom over areas many acres in extent. The commercial experiment carried on at Anclote Key showed that even in an unfortunately selected locality, cuttings would grow rapidly when planted with a density of about 1 square yard over an area of about 15 acres, and that the growth was no less satisfactory than upon the Government's neighbouring plantation covering but a few acres. In no case on any of the plantations did the density of planting, up to a maximum of a little over one sponge per square yard, have any apparent effect upon the rate of growth. In planting on a small scale, sponges have been planted in some cases as densely as five or six per square yard without apparent bad effect, but with extensive areas so thickly planted there might be a probable insufficiency of food. Experiments in Biscayne Key appear to indicate that sponges grow more rapidly in strong currents, and presumably the same conditions would permit denser planting than where the currents are weak. The experiments of Mr. H. F. Moore show that the raw surfaces of cuttings become pigmented within a few days, and that at the end of a month they have completely healed and begun to grow and project little papillae or cones. Sharp angles and edges generally die and slough off slightly, and the central portion of the plane faces becomes swollen, so that at the end of three months in small cuttings, and somewhat later in larger ones, there is evident a distinct tendency to rotundity. At the end of six months in many specimens

the cut faces cannot be distinguished from the original surface of the sponge, and in practically none can they be determined except by the shape.

Growth takes place in all directions with approximate equality when the cuttings are suspended freely in the water, but is generally more rapid in the horizontal plane when the sponge is attached to a basal support. If the cutting be attached to a small horizontal surface it will grow downward over the edges, and if the surface be uneven it will project itself into all the irregularities and holes. For this reason, if basal attachments are used, it is desirable to have them with smooth surfaces and of a horizontal expanse greater than that of the sponges which it is desired to grow, otherwise considerable weight and also time is lost in trimming the marketable specimens to a desirable shape.

Indications in Biscayne Bay show that the average growth of sponges planted in Cape Florida Channel is slightly in excess of the rate shown at Anclote Keys and Cape Florida. The difference in the rate of growth may be due to the strength of the current, or to the larger amount of food in the waters adjacent to marine vegetation. That the latter is the more probable reason is indicated by the fact that sponges planted on bottoms covered by short grass at Soldier Key exhibit a more rapid rate of growth than those planted on bare rock.

The slower rate of growth in the warmer waters of Sugar Loaf Sound was a surprise, and it may possibly be accounted for by the general absence of strong currents or by the character of the seed sponges. These were all small specimens, rarely over 5 ins. in diameter, obtained from the waters of the Sound, which, while formerly producing large ones, now rarely does so, possibly as a result of over-fishing in former years.

The inevitable tendency of an intensive fishery of this character would be to breed a race of more or less dwarfed sponges of slow growth, an assumption which is in a measure confirmed by the fact that Sugar Loaf Sound formerly produced a much greater proportion of large sponges than it does at present. This could not be due to the intensity of the fishery, as the Sound was then closed to promiscuous fishing and the sponges had ample opportunity to grow to a larger size than the average attained.

In Biscayne Bay and Anclote Key the seed sponges were obtained from partially depleted beds, but owing to the greater depths and the more frequent prevalence of turbid water these have never been so thoroughly scoured of marketable sponges. The specimen from which cuttings were made were larger and presumably more virile, and in any event the cuttings grew more rapidly. At Sugar Loaf and Anclote Keys the planted sponges were measured at intervals by means of calipers, and occasionally specimens of average size were taken and cleaned.

The experiments with wires appeared to show that sponges suspended above the bottom grow more rapidly than those growing on or near to the bottom, but more recent results with discs and triangles appear to throw some doubt on this. It is probable that dense vegetation amongst which the sponges lay had an inimical effect and the sponges planted on the bottom where they would not be covered by vegetation would grow as rapidly, or nearly so, as those suspended above it.

It has been found that those sponges grown suspended above the bottom are superior in density and closeness of fibre to the natural sponges from the same locality. The same superiority is not apparent in those

grown on discs, but the absence of the torn surface or root which characterizes the natural product makes them much more durable than the latter, the close felting of the attached surface making it the softest and strongest part of the sponge. In other words, the place of greatest weakness, i.e. the root or place of attachment, is converted into that of greatest strength, while the other parts remain normal. The artificially grown specimens are always superior to the natural product of the same locality.

At Anclote Key a great proportion of the sponges grown on the bottom are affected with so-called crab holes, cavities which commonly contain small crabs. The general opinion of the fishermen is that the crustaceans produce the holes, but this is by no means assured. Practically all the sponges planted on the bottom in this locality were previously injured by fresh water, and already bore patches of dead tissue when planted on the bottom. As these dead areas sloughed away they left cavities, thus inviting the crabs, which thus did not actually excavate their hiding places. In hundreds of examinations made of both artificially and naturally grown sponges, not the slightest indication of the raw surface which would have been looked for as if the crab had torn away the tissues of the sponge has been seen. The presence of the crab, however, undoubtedly prevents the hole from filling up, as it would tend to do under other conditions. That is distinctly an advantage, although the hole itself detracts to a greater or less degree according to its size from the value and usefulness of the sponge.

In order to transport sponges from the Gulf of Florida to the Californian coast various methods have been suggested. Some have been transported by Express, closely and carefully packed with wet eel grass and

Gulf weed (*Sargussum*) over distances requiring three days between the time of removal from the water and the time of replanting. Although carried in heated express cars they are absolutely uninjured, and started growth immediately after transplanting.

If kept cool the sponges will live much longer, and there is reason to believe that if carried in moist packing

"DARBY AND JOAN" IN SPONGE

in refrigerator cars there will be little doubt of their surviving a trip extending over one week. Thus, with proper arrangements, Florida sponges could be carried alive to the Californian coast. The water used in moistening the sponges and the packing material must be of full oceanic salinity, an experiment having shown a mortality of 50 per cent among sponges sent on a three days' journey when a portion of the packing

material was inadvertently moistened with nearly fresh water from the Anclote River.

At Anclote, also, it was observed that whatever the source of the sea there was a strong tendency of the plants to advert to a common type, though there appeared to be a tendency to compromise between the influences of heredity and environment. Deep water sponges a year after the cuttings were planted assumed a bristly appearance, but the processes were shorter and blunter than in sponges grown from shallow water seed. The texture of the skeleton was also closer and more dense than in the cuttings of shallow water origin, but neither resembled very much the sponges from which they were derived.

With these facts in view, it is almost certain that Florida sponges transplanted to the Californian coast or Mediterranean specimens carried to the waters of Florida will not retain their original characters, but it does not follow that they will be inferior. It is even possible that with judicious selection localities may be found where the transplanted products may prove superior to their fellows at home, though it is true that one can hardly expect to improve on the fine quality of the sponges of the Mediterranean.

## CHAPTER XVIII

### THE LOOFAH, OR VEGETABLE SPONGE

THE loofah, or vegetable sponge, is indigenous to Egypt, as its botanical name *Luffa Egyptica* indicates. It resembles a vegetable marrow in shape, and when deprived of its pulp a network of strong fibres is left which soften very much when wetted. It varies in length and girth very much, the most useful sizes being those from 8 ins. to 22 ins. in length. Loofahs are chiefly used for the toilet and bath, but very largely in the form of flattened and shaped loose soles worn inside boots and shoes and bath-room slippers. The effect of their use in these forms is to keep the feet warm and free from damp. When used in the bath or for the toilet they produce lather freely with soap and are most effective in cleansing the skin and giving it a healthy glow. It must be confessed that the friction necessary for the production of these effects is somewhat painful for sensitive skins, but for the cleansing of hands rendered very grimy by the toil of coal miners and many other workers there is nothing more effective than a loofah with soap.

Loofahs were first cultivated in Egypt and were used extensively for the toilet. An English authoress, who visited some of the harems there, speaks of the ladies as using them and attributing the fineness and softness of their skins to their regular use. They are also cultivated in parts of India, such as the Kangra Valley. But the country which has taken up their cultivation the most seriously and successfully is Japan. In fact, it is the only country from which properly graded and

trustworthy supplies can be relied upon. Labour is cheap in that country, and consequently she can sell this product at very low prices ; whereas other countries possessing a suitable climate cannot successfully compete because their labour costs more. Loofahs are grown on continuous horizontal wooden rails supported at distances of about 6 ft. by wooden stakes. They hang downwards from the vines. When ripe they are cut off at the stems and taken by the labourers—men, women and children—to the neighbourhood of a running stream in which they are immersed for about a week. They are then taken out and the pulp pressed out from the fibrous structure. After being dried they are compressed into bales weighing about 220 lbs., and containing from 5,000 small size (8 ins. to 10 ins.) to 1,200 largest size (18 ins. to 22 ins.). They are placed horizontally in the presses so that the length is unaltered, but the girth of the Loofah is reduced from, say, 5 ins. diameter to about ½ in. They are sold to the consumer in their pressed state, as it is quite easy to swell them to their normal size by dipping them in hot water.

## CHAPTER XIX

### MODERN LITERATURE IN CONNECTION WITH SPONGES

In the opening chapter of this book I have surveyed the many references to the sponge in ancient Greek literature, both in poetry and in prose. It would be fitting at the close of my work to give a glance at the books and pamphlets, etc., in modern literature which make allusion to the subject.

The Ancients wrote and sang about the sponge as one of the most wonderful products of Nature. Sponges continue to grow pretty much as they did then ; but present writers do not write as those of old did. Having the assistance of modern instruments and machinery, continuously improved, they have been able to study their subject much more scientifically and have arrived at definite and correct conclusions which the Ancients were unable to form. The imaginative and poetic sides of the subject may not have been given rein to, but there are many works that are of great value as accurate contributions to science and most charmingly written.

The only novel written round the subject is by M. Le Comte de Vogüe, Member of the French Academy. The longest and generally most satisfactory work on sponges is *The Commercial Sponges and the Sponge Fisheries*, by H. F. Moore, Scientific Assistant United States Bureau of Fisheries, Washington, 1910. I have found much material in this clever and well-written work. I have received permission to make use of a good deal of information given in it, for which I tender my grateful thanks.

I also have to express my gratitude to my relative,

Mr. Elia Faclis, who has made a profound study of ancient Greek literature, and noted all that relates to sponges and sponge-diving in it. All I have written on this most interesting part of the subject of sponges is based on Mr. Faclis's labours, in which he was greatly assisted by Mr. Demosthenes Chaviaras, the well-known historian of ancient Greece, residing at Symi.

Miss Amelia Dorothy Defries has written a most charming book consisting of what she very modestly terms "Studies" in Nassau, etc., during 1916. Its title is *In a Forgotten Colony*, with many illustrations (published by *The Guardian* Office, Nassau, 1917). The following are a few extracts—

"Nassau is a favoured spot; submarines, cyclones and hurricanes go 'somewhere else,' and we know (if there is any comfort in that) 'somewhere they are getting it.' The syncopated rhythm of the spongers permeates Nassau, where, in the large sponge yards owned by Young & Son and others, the heavy modulated singing is accompanied by the regular clip, clip, clip, clip, clip of numerous big trimming scissors, the orchestral effect of which would be fine on the stage. You may know that those women, followed by crowds of chocolate-hued children sucking sugar-cane or carrying large pieces of cantelupe melon dripping juice, spend part of their lives as I have described. And their names will be, possibly, Blooming or Tryphena or Galilee; while the men are often named Bristol Ash, Liverpool Minus, Jolly Bean, and so on.

"I have heard, too, of a man who never worked for a living, but when he wanted anything he would appear with one piece of Spanish gold and would buy what he needed. No one ever saw him with more than one piece of gold money and no one knew where it came from. But the general idea was that he had come

across some buried treasure lying on the bottom of the sea, and had the wisdom not to bring it all to the surface; when he had use for a piece he simply dived for it.

"What is ignorance? Not long ago one of the spongers went into the office of the local newspaper in Nassau, and when the editor showed him the type-setting machine and the printers at work he asked: 'Boss, do dey print de Bible and hymn-books same as dis?' 'Of course they do,' was the reply. 'Say, boss, den dey isn't printed by the angels?' If you can believe that a grown man truly thought angels in heaven printed the Bibles and hymn-books you will have some idea what manner of folk I was among.

"All around in the sea are the miraculous sea-gardens, and the marvels of these waters are to be found around almost all the other islands. Two spongers took me out in a blue cockleshell boat one day, and through their glass-bottomed bucket I saw the life of the sea, where the brilliant coloured fish swim among purple and yellow sea-fans, and brown feathers wave above their heads; from a deep grotto in the white sand a huge crawfish emerged, slowly and with great dignity, like a Grand Duchess of the Austrian Court—with due form and ceremony and much waving of whiskers she went to call on Madame Crawfish in the opposite grotto—and the rhythm of these two as they swayed down the path together (all the little fishes scurried out of their way) was like some mazurka of antique date. Looking down in another spot I saw the most lovely purple sea-fan I had ever noticed. I exclaimed at its size and brilliance, and as I did so I heard a soft movement behind my back. Looking round I saw only a coat on the seat where a man had sat a few moments before. Presently . . . a puffing sound on the other

side of the boat, and a muscular young negro was swimming towards me with the free movements of a man used from childhood to the water. He was laughing and in his hand was the purple fan I had seen growing on the sea-bottom. 'Dis de one you'se admiring, ma'am?' he asked gently as he climbed dripping into the place he had so recently vacated, laying the fan in the boat at my feet. It seems he had slipped overboard and without a splash had dived to the bottom, open-eyed, fully dressed in blue shirt and woollen check trousers.

"On the far side of Hog Island is the coral reef, which keeps the sharks away and makes the glittering shore a safe bathing place. Here the sea is transparent as glass and shines like a white basinful of crushed jewels over which a purple film, like the bloom on grapes, has been blown. In its depths it holds what seems to be the essence of melted emeralds, on its surface scintillates the dazzling brilliancy of finely-cut diamonds. It is also warm and often hot—sometimes rough, but oftener it is calm. When the ice lies on the New York streets the sea here is tepid. Because no words can convey its colours or its fascination, a friend of mine has described it as the water where angel fish live. The fishes who live in it are beyond description, but parrots have not more amazing colours and patterns. To watch them swimming lazily about in their luxurious gardens, in whose grottoes grow purple and canary-yellow sea-fans and waving feathers of mauve, is an easy matter, and if you have a sail-boat you are as free as they are.

"Nassau is best described in the words of Stephen Haweis, who was here last year: 'Imagine, if you will, a flawless emerald, to be measured only by the square league; imagine violet sea-fans, 8 ft. high, or fantastic

grottoes such as only coral polyps build, such things are commonplaces of Nassau days . . .' I have seen enough of this artist's work now to realize that wherever he might do a decoration he would distil the character of the region and produce a synthetic interpretation of the essential personality of the daily life in that place ; for he has, unconsciously, the true civic spirit. So that a decoration he might do, let us say, in London would be quite unlike the one he has done in the Bahamas. But if, as is rumoured, he should be commissioned to paint on the walls of the New York Aquarium, he would probably base that work on the innumerable studies from life that he is now making in the sea gardens, where the natural wonders 'transcend the wildest dreams of the Arabian Nights.' He has spent the best part of a year rendering articulate the inarticulate beauty of the place ; and 'the joy of his great sanity is not less because he can lend it to others and has borrowed it from a faithful study of the world.' Another interesting side to this second period of his art is suggested in his catalogue when he writes : 'A modern artist, seeking the laws governing the rhythm and movement in plastic expression, should go to the sea gardens of Nassau, as the last generation went to the Louvre or the National Gallery of London.' The effect of his work on the New York art critics was best expressed by Mr. Charles Caffin, who wrote : 'The sea gardens of Nassau became to Haweis' imagination the nucleus of the rhythms of the universe and a perpetual object lesson of the magic of rhythm in harmonizing physical, mental, and spiritual sensations. . . he has secured this harmony by establishing rhythmic relations between all the parts selected, so that everything is united in a decorative ensemble. His decorative sense is distinguished by a fluent creativeness that finds

expression in ample forms and subtle delicacies. And to the fascination of these designs is added a remarkable suggestion of objective truth. The marvellous beauty of the sea gardens has been wonderfully visualized.' "

Mr. Stephen Haweis is the son of the Reverend H. R. Haweis, author of *Music and Morals* and other works. He was the vicar of a London church for many years, and was a wonderful musician and lecturer on music, as well as a most eloquent preacher. The son, to judge from a reproduction of one of his paintings of a sea garden in Nassau, evidently is in sympathy with the Cubist school, although not a Cubist himself.

Much of the writing in Miss Defries' book strikes the mind as reproducing some of the effects of a residence in Nassau, as do the descriptions contained in an article which appeared a few years ago in the *Windsor Magazine*—

" The method of harpooning, less in favour in the Mediterranean than in other sponge fisheries, is probably seen at its best in the Bahamas. Indeed, it is difficult to imagine a prettier scene than Nassau harbour on a fine sunny morning, when the fleet of sponge vessels—numbering over 500 schooners and 2,800 boats, and employing over 5,000 men and boys—are starting for the fishing ground. The schooners, scattering as they leave the harbour, select each their own particular anchoring ground, the coolies on the ships having been hard at work preparing meals for their respective crews. The schooners, graceful little craft, built like yachts of wood, copper sheathed and clamped, are each followed by a train of from five to twenty-five rowing boats varying in number in proportion to the tonnage of their leader, which ranges from 6 to 50 tons. To an onlooker the scene is entrancing—the calm, clear waters ; the boats with their dusky occupants occasionally

silhouetted on the horizon ; the parent vessels, their sides glittering in the sun as if coated with gold, form an almost perfect picture. To the outsider, too, the life appears to be ideally healthy—almost idyllic, but in truth it must be confessed that the life of a sponger is not an entirely enviable one. His life is one of hard work ; his fare is of the coarsest. Rice, hominy, very little salt pork and flour, are the usual provisions stocked ; flour is the most important, and an absolute necessity when hard work is expected ; and the sponge fishers, beyond a meal before starting work and one in the evening when they return to the schooner, get nothing between but bread and water. The hardships on board the vessel in which they are, are, in point of fact, very considerable, and—as will be explained later—the accommodation on board the schooners is not strictly reserved for the captains, mates, cooks and crews."

This vivid writing is from the joint pens of M. Dinorben Griffith and Dr. Sawyer, who utilized much material supplied to them by me. Further it describes two subjects not hitherto touched upon in this book, and that is the bleaching and the drying of sponges. At 18–19 Red Lion Square, occupied by the Cresswell Brothers Branch of International Sponge Importers, Limited, there is a steam bleachery which is the largest in Europe. The process is most interesting, starting as it does from the unbaling of the raw, compressed goods to the casing of the finished product, which can be examined in detail. Various improvements have been introduced into the mode of bleaching now in use since the article referred to was written. After the bleaching, the drying, sorting, stringing, carding and other operations are carried on here on a large scale.

" Of special interest is a drying system lately installed.

A 10 h.-p. nominal vertical boiler occupies one corner of the engine room, the base of the chimney shaft, 70 ft. high by 4 ft. square, occupying the adjacent corner. On one side of the room is a 5 h.-p. nominal horizontal steam-engine driving two lines of shafting, one overhead, the other underground, in a brick and concrete trench which, passing right under the yard, terminates in the bleaching room where it supplies the necessary motive power to two sets of indiarubber rollers for squeezing as much water as possible out of the sponges after their final washing preparatory to the drying process. The exhaust steam from the engine is completely utilized in the following manner : It passes in the first place through an oil-separator. After leaving the oil-separator, the steam passes on to the air condenser above the engine. This is a hollow iron case, in size only about 1 cu. yd., containing a large number of hollow, stamped steel plates united together by the edges in pairs, forming four series of hollow elements and all communicating with each other. Although the plates are only of a thickness of stout brown paper or thin card, and steel is one of the highly infusible metals, they are melted together on the edges by the use of an acetylene flame, raised to the temperature of 5,200° by a jet of oxygen gas stored in cylinders at the pressure of 1,800 lbs. to the sq. in. This heat is so perfectly under control and can be used so accurately, that the thin steel sheets can be worked in any desired manner by its use. On one side of the case a small fan, whose periphery is revolving at the velocity of over 150 miles an hour, drives thousands of cubic feet of air per minute into the outer case of the air condenser. The current of air, heated to any requisite degree by the heat given up by the steam, passes down a duct in one corner of the engine room

and through an underground duct to the drying room, where it can be distributed exactly as may be required, thus insuring an extremely rapid drying in a continuous stream of fresh, warm, dry air."

The Williamson Submarine Film Corporation exhibited at the Philharmonic Hall, in Great Portland Street, London, W., a remarkably beautiful and interesting film, shortly before the Great War broke out. By means of electric lights let down into the sea and with cameras likewise submerged they had taken delightful views of the Nassau Sea Gardens in their various aspects, and, most remarkable of all, a fight between a negro sponge fisherman and a shark in which the man was victorious. These representations of the beauties of the sea-bottom and a conflict between man and his greatest enemy of the sea, would have indeed astonished the ancient Greeks.

In the *Strand Magazine* a few years ago a most interesting and well-illustrated article appeared, which was the outcome of an interview with the author. In the course of the article I am quoted as stating the following—

" Like the coral fishers, who never allow anyone to accompany them or to witness their fishing operations, sponge divers are very exclusive in the matter of curious visitors. My cousin, Mr. G. H. R. Brown, of Aegina," says Mr. Cresswell, " is, I believe, the only Englishman who has been through an entire season of sponge diving with the Greeks themselves. The reason for his being accorded the privilege, however, is not far to seek. He has always lived amongst them, and is regarded as a blood-brother. Moreover, they will work for him at a nominal rate, whereas their zeal for an ordinary English employer would be conspicuously absent. It thus happens that we can own and fit out boats successfully which in former times would have caused us great loss.

We should like to point out that these men are well aware of the hardships and dangers of the diving trade. They undertake their task entirely of their own free will or, I should add, of necessity. Their native islands are very bare. Agriculture is in its most primitive state, hence the inhabitants are only too glad to revert to sponge fishing for a living. In summer the boats go out hundreds of miles from their native shores, but in winter the fishermen do not venture far out and only dive in comparatively shallow waters. As a matter of fact, the sponge fishing fleet is managed on much the same lines as the trawling system in the North Sea, and Aegina is the Grimsby of the sponge trade.

"Our divers have made some queer finds: for instance, we have in our possession some remarkable amphorae, which date as far back as 200 B.C. They are the envy of lovers of antiquity, and needless to add are also extremely valuable."

Besides other interesting and valuable objects brought up from the sea was the largest piece of black coral ever known. The usual tradition being followed, the Greek Church benefited to no inconsiderable extent before the enormous specimen—the fan-like branches extend over 5 ft. square—found its present resting-place in the Natural History Section of the British Museum. There is also in the same gallery a very fine collection of sponges selected by Mr. Kirkpatrick of the British Museum at Messrs. Cresswell Brothers' warehouses.

The commercial part of the sponge trade in England —and London is universally recognized as the chief centre of this branch of industry—is chiefly in the hands of International Sponge Importers, Limited, its business being carried on by means of branches, the chief of which are I. & M. Cohen, Cresswell Bros., and

H. Marks & Sons. The first and last are situated in Houndsditch and the Cresswell branch at Red Lion Square. The directorate consists of seven directors, assisted by two general managers.

The words of the following song are appropriate to our subject. Set to very good music, it was very popular a few years ago. It was set, suitably, in a low key and was a great favourite with bass singers.

## THE DIVER

*Words by* G. Douglas Thompson

*Music by* E. J. Loder

In the caverns deep of the ocean cold,
The diver is seeking his treasures of gold.
Risking his life for the spoil of the wreck,
Taking rich gems from the dead on her deck.
And fearful such sights to the diver must be,
Walking alone in the depths of the sea.

He is now on the surface, he's gasping for breath,
So pale that he wants but the stillness of death
To look like the forms he has left in the caves,
Silent and cold 'neath the trembling waves.
How fearful such sights to the diver must be,
Walking alone in the depths of the sea.

And Mammon's the master and man is the slave
Toiling for wealth on the brink of the grave.
Leaving a world of sunlight and sound
For night-like gloom and a silence profound.
And fearful the death of the diver must be,
Sleeping alone in the depths of the sea.

In quite another vein—a kind of badinage—are the following verses, which recently appeared in *Punch*—

NEW RHYMES FOR OLD CHILDREN

THE SPONGE

The sponge is not, as you suppose,
A funny kind of weed;
He lives below the deep blue sea,
An animal like you and me,
Though not so good a breed.

And when the sponges go to sleep
The fearless diver dives;
He prongs them with a cruel prong,
And, what I think is rather wrong,
He also prongs their wives.

I know you'd rather not believe
Such dreadful things are done;
Alas, alas, it is the case;
And every time you wash your face
You use a skeleton.

So that is why I seldom wash,
However black I am,
But use my flannel, if I must,
Though even that, to be quite just,
Was once a little lamb.

—(*A. P. H. in "Punch,"* 1921)

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